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RODRIGUEZ SARDIÑA (J.). **Notas sobre viroses. II. La clasificación de los viruses. III. Tres conferencias del Doctor Bawden.** [Notes on viroses. II. The classification of viruses. III. Three lectures by Dr. Bawden.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 115–134, 11 figs., 1944.

Part I of the author's study entitled 'The present status of the virus problem', appeared in *Bol. Pat. veg. Ent. agríc., Madr.*, x, pp. 33–38, 1942. In part II he discusses the various systems of classification that have been proposed for the accommodation of the viruses, with special reference to those of Holmes [*R.A.M.*, xix, p. 229] and Ruska (*Arch. Virusforsch.*, ii, 5, pp. 480–498, 1943). Part III is a summary of three lectures delivered by Dr. F. C. Bawden in Lisbon in February, 1945, the first dealing with the control of the damage caused by viruses, the second with the effects and characteristics of viruses, and the third with their structure and properties.

BENLLOCH (M.). **Nueva enfermedad de las Judías Phaeoisariopsis griseola (Sacc.) Ferr.** [A new Bean disease, *Phaeoisariopsis griseola* (Sacc.) Ferr.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 27–32, 4 figs., 1944.

A visit to Vélez in the province of Málaga revealed the presence on beans (*Phaseolus vulgaris*) of *Phaeoisariopsis* [*Isariopsis*] *griseola*, of which there appear to be only two previous records for Spain [cf. *R.A.M.*, xvi, p. 564; xxiv, pp. 206, 476]. The conidia produced by the Málaga isolates were mostly triseptate, measuring 39·2 to 70 by 5·6 to 7 μ, while the extreme limits ranged from 28 to 31·8 by 5·6 to 8·4 μ (uniseptate) to 67·2 to 80·3 by 5·6 to 8·4 μ (quinqueseptate). Infection over a small area may be combated by the burning of diseased material at the first sign of attack, but fungicidal treatments are requisite for more extensive foci. Copper-containing mixtures have proved unsatisfactory for this purpose, and experiments with preparations of another kind are planned.

NUSBAUM (C. J.). **A preliminary report on internal cork, a probable virus disease of Sweet Potato.**—*Plant Dis. Reptr*, xxix, 25/26, pp. 677–678, 1945. [Mimeographed.]

The observation of dark, hard, corky spots on the flesh of the Porto Rico variety of stored sweet potato at Edisto Experiment Station, Blackville, South Carolina, coincided with a similar disorder reported from Barnwell and Orangeburg counties, on stock being removed from storage and packed for market. Several pieces of seed roots which exhibited internal cork spots were bedded and the sprouts planted in the field for observation in 1944. As the flesh symptoms bore some resemblance to boron deficiency of garden beet, experimental plots were also established on limed and unlimed soils, supplied with five levels of boron through applications of 0, 5, 10, 20, and 30 lb. of borax per acre.

Late in the 1944 season indistinct purple ring-spot symptoms were observed generally on the older leaves of plants grown from corky seed and to a less extent in other plantings at the Edisto Station. At harvest internal cork was observed

on roots of plants showing ring spot. Failure to isolate an organism from corky tissue of freshly dug and stored roots caused the possibility that a culturable pathogen was involved to be set aside, and the fact that ring spot and internal cork symptoms occurred indiscriminately throughout the borax treatments eliminated the possibility that boron deficiency was a causal factor.

Corky spots, irregular in size and shape, occurred sporadically in the fleshy tissues of the root, and could not be detected without cutting it. Small surface cavities were sometimes associated with spots located near the periphery of the root, but none of the spots was observed to erupt to form a surface lesion. Microscopically observed, the corky spots were shown to be composed of a central area of collapsed cells surrounded by a suberized phellem layer several cells thick.

The first leaves of sprouts from severely corked seed roots to unfold were either stunted and deformed or showed an indistinct necrotic stippling near the margin of the leaf blade. These spots enlarged in 4 or 5 days to a diameter of ½ to 1 mm. and then dropped out, leaving the leaf margin perforated, and the margins appeared scalloped owing to the uneven expansion of the leaf blade as the spots enlarged. A recovery followed, as the succeeding leaves unfolded without showing any visible symptoms and the affected leaves were shed. At pulling time the sprouts appeared to be healthy.

On infected sprouts transplanted to the field, as soon as the vine growth began to decline after from 4 to 6 weeks' normal growth, the older leaves showed an indistinct pale yellow or green mottling. Later a purple discoloration appeared at the margins of these spots and in a few days clearly defined purple ring spots were formed. When these fade, the leaves became chlorotic, eventually showed a dull bronze mottling, and soon fell. As the leaves mottled, internal cork was invariably found in the roots.

It was observed that on varieties devoid of anthocyanin pigmentation, no purple ring spot or bronzing appeared, but the spots remained yellow and chlorosis of the leaves set in, the plants assuming a prematurely aged look. The symptoms seem similar to those of a virus disease of sweet potato described by Hansford [*R.A.M.*, xxiv, p. 117] from East Africa, notably as regards bronzing of the leaves, although root symptoms are not mentioned by him. Internal cork is general, though at a low level, in South Carolina, to which state it is probably confined.

ROACH (W. A.). **Mineral deficiencies in agricultural and horticultural crops.**—*Rep. E. Malling Res. Sta., 1944*, pp. 43–60, 2 figs., 1945.

In this report of work done by the joint team of the East Malling Research Station and the Research Institute of Plant Physiology, Imperial College of Science and Technology, it is stated that leaf-analysis and -injection methods have been used on agricultural and horticultural crops during the war for the diagnosis of mineral deficiencies. The results showed that widespread partial and complete failures in potatoes on freshly ploughed derelict land were associated with calcium deficiency and in most localities visited with magnesium deficiency also, though neither could be diagnosed by leaf symptoms. Rectification of the deficiency increased the crop in 1943 by 3,000 tons on these derelict lands alone. By means of these methods manganese deficiency was diagnosed in wheat that showed no symptoms, spraying with manganese sulphate increasing the yield to an economically important amount. The yield of early potatoes, showing no symptoms, but in which manganese deficiency was diagnosed by leaf injection, was increased by spraying with manganese sulphate by from four to five tons per acre. Widespread and severe deficiencies of potassium and of iron or manganese or both were diagnosed in apples. In cherries multiple deficiency of manganese, iron, and zinc was cured by injection of all three elements.

MEIER (K.). **Bericht der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für das Jahr 1943.** [Report of the Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil for the year 1943.]—*Annu. agric. Suisse*, lviii, 10, pp. 891–953, 1944.

Much of the work described in this report [cf. *R.A.M.*, xxiii, p. 90] has already been noticed from other sources, but the following items may be of interest. Only one of several chemical preparations tested for their efficiency against apple scab [*Venturia inaequalis*] was found by C. HADORN to be equal to pomarsol, and that was 2317 W (I.G. Farben) [ibid., xxii, p. 315], which may safely be applied to sulphur-sensitive varieties. S.B. 42 (Chemische Fabrik, vorm. B. Siegfried, Zofingen) gave good control of scab, but was incompatible with lead arsenate.

In further experiments by the same worker to determine the relative merits of various 'reserve sprays' [loc. cit.], 4 per cent. Bordeaux mixture again proved its worth, while 2 per cent. copper Sandoz also gave good results; however, as it does not form as close or even a deposit as Bordeaux mixture, it should be applied as late as possible in the season. Pomarsol 4160 exerted a certain prophylactic action, but was not sufficiently persistent. It is essential that a fungicide should be found combining a protective effect of reasonable duration with safety to the trees.

C. HADORN further tested a number of German copper-saving plant-protectives against vegetable diseases.

H. LÜTHI found *Penicillium* the most refractory of the moulds contaminating sweet must, *Aspergillus* and *Mucor* spp. being less prevalent in industrial plants. Ethyl alcohol, the usual disinfectant, failed to destroy the spores of *P.* spp. in some of the writer's tests even after several hours' exposure.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lvi, 11, pp. 503–506, 5 figs., 1945.

In New South Wales banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, xxi, p. 123; xxiv, p. 354] and 'speckle' (areas of black or greyish dots on the under side of older leaves, of indefinite etiology but believed to be a secondary development of injury by red spider) [cf. ibid., xxiv, p. 428] generally occur together. The most destructive form of leaf spot develops during rainy weather in summer, many leaves being attacked at the heart-leaf stage or as they are unfurling. Most infection takes place through the under surface. The heaviest losses are sustained by plants carrying bunches of fruit during the period January to May; most of the foliage supporting these bunches emerges in summer and if not sprayed it is generally severely attacked. Speckle may be restricted to patches, or it may involve large areas of leaf. The affected parts exude droplets of moisture in rainy weather, and large portions of the leaf ultimately succumb.

Defoliation caused by these two conditions results in heavy loss of fruit. Sometimes the bunches drop off, and the survivors are poorly filled, the pulp being discoloured and over-mature. After ripening, the fruit is dry and has a poor flavour.

Three or four waves of leaf-spot activity occur during the year, each following upon a period of rain. The spring and summer outbreaks are much less serious than the later ones. Speckle is also most destructive in autumn and winter.

Control measures recommended against both conditions consist in spraying each month from early December until March all plants bunching from January to May with a suspension of copper oxychloride (1½ lb. per 40 gals.), and colloidal sulphur (1 lb. per 40 gals.), plus a wetting agent (1 fl. oz. per 16 gals.). In February and March spraying should be applied to plants bunching from June to August. Every spray must be directed to the under side of the three youngest leaves and to the heart leaf, and spraying should be discontinued when the bunch is out. The spray should be applied from two directions at the heart leaf, to reach the central cavity. Bordeaux mixture (1–1–10) may be used if preferred. Vigorous growth should be

promoted by de-suckering to one plant—one sucker, or two plants—two suckers, fertilizing, weed control, and winter cultivation. In valuable plantations the installation of permanent spray lines may be advisable.

Against passion fruit brown spot (*Alternaria passiflorae*) [ibid., xxi, p. 364] the most useful spray is Bordeaux mixture (4–4–40), which should be applied in spring, before the vines become too dense, and repeated at monthly intervals throughout summer and autumn. The spray should be applied at 200 lb. pressure, and good coverage secured of canes and foliage. The removal of diseased leaves by hand in conjunction with spraying is worth trying in small plantations.

MILLER (R. W. R.). **Annual Report, Department of Agriculture, Tanganyika Territory, 1944.**—9 pp., 1945.

Potato blight (*Phytophthora infestans*) [*R.A.M.*, xxiv, p. 8], having lately been reported from Kasulu in the Western Province and from Mbeya in the Southern Highlands Province of Tanganyika Territory, is now present in all the important potato-growing areas in the Territory; and the bacterial ring rot of potatoes recently recorded in Kenya [ibid., xxiv, p. 200] has been found occurring in one field in the Usambara Mountains in a crop grown from imported seed. Blight (*P. infestans*) of tomato has appeared in the Territory and a virus disease of sweet potato, which is also present in the Belgian Congo and in Uganda [see above, p. 98], has been observed in the Lake Province, causing considerable loss of crop.

GILLMAN (H.). **Sisal Experiment Station, Tanganyika Territory. Report for the year 1944.**—16 pp., 2 graphs, 1 diag. [? 1945. Received January, 1946.]

During 1944 the only noteworthy disease that affected sisal [*Agave rigida* var. *sisalana*] at the Tanganyika Experiment Station was a physiological condition producing a yellow discoloration of the tip ends of the lower leaves, which then turned reddish, and finally died back. The trouble appeared to be associated with some unknown soil factor, but there was no evidence that it was related to the nitrogen, potassium, or phosphorus status of the soil [cf. *R.A.M.*, xxiv, p. 508].

Papaws died off in rather large numbers as a result of bud-end rot due to *Pythium* sp. [cf. ibid., xxiii, p. 235].

WILLIAMS (R. O.). **Annual Report on the Department of Agriculture, Zanzibar Protectorate, 1944.**—8 pp., 1945.

In continued investigations on the 'sudden death' of cloves [*R.A.M.*, xxiii, p. 40] during 1944, solutions of minor elements applied to clove seedlings produced no noteworthy symptoms, except in the case of boron, which caused colour changes in the leaves. Leaf samples from the treated plants were collected, dried, and despatched with others, to the Long Ashton Agricultural and Horticultural Research Station, for spectrographic analysis. Experimental watering of mature trees selected from a block threatened with decimation by 'sudden death', to observe the effect of maintaining a constantly moist soil, was without material effect on the rate of mortality.

The possibility of regenerating a block of trees under a gradual reduction of canopy was, however, successfully demonstrated on an affected site cultivated under a system of management recommended for ordinary plantation conditions. Young saplings interplanted between moribund old trees are now maturing well and casualties have been few.

Fifty-seventh Annual Report of the Colorado Agricultural Experimental Station for the fiscal year, 1943–44.—44 pp., 1944.

The following items may be noticed in this report [cf. *R.A.M.*, xxii, p. 381]. Mild strains of peach mosaic [ibid., xxiv, p. 154] continued to show antagonism to

severe strains, and it is suggested that the use of nursery stock inoculated with harmless mild strains may offer a means of mosaic control where eradication is not possible.

Dusting with copper oxide controlled tomato fruit rot [unspecified] as effectively as Bordeaux spray; and in home gardens staking and mulching are recommended as reducing or preventing the disease. Technical studies showed that the fungus chiefly attacks the blossom end of the fruit, which in some susceptible varieties is less resistant than the stem end. Resistance would appear to be associated with the presence of crystals in the fruit cells. Some varieties definitely showed resistance.

A preliminary study was made of root rots of sugar beet; and *Verticillium* wilt of sugar beet was found to be correlated with soil temperature. The addition of fertilizers to the beet seed, plus fungicides, gives better seedling stands than the use of fungicides alone, a fact regarded as of great importance in view of the sheared seed used to-day.

Fifty-third, fifty-fourth, and fifty-fifth Annual Reports of the New Mexico Agricultural Experiment Station for 1941–2, 1942–3, and 1943–4.—78 pp., 11 figs., 1 graph, 1942; 62 pp., 2 figs., 1943; 76 pp., 6 figs., 1944. [Received December, 1945.]

The following are among the items of phytopathological interest in these reports. *Fusarium* [*vasinfectum*] var. *zonatum* [f. 1] and *Phoma terrestris* predominated in the numerous isolations made from onions suffering from pink root rot [*R.A.M.*, xvii, p. 7; xxiv, p. 45] in various stages of development, the latter fungus apparently being the primary agent of the disease and the former a wound parasite. Chloropicrin gave effective control of the pathogens in greenhouse soils when applied at the rate of 3 c.c. per hole 6 in. deep and 12 in. apart, but larger quantities of the fumigant are required for field treatments, further experiments on which are planned. *P. terrestris* appears to be more susceptible to high temperatures than *F. vasinfectum* var. *zonatum* f. 1.

The results of several years' work have shown that resistance to curly top in sugar beets [ibid., xxiv, pp. 83, 130] is obtainable through breeding and selection; in tests in 1943–4, 67 beets from 11 varieties were selected in connexion with the development of combined resistance to curly top and leaf spot (*Cercospora*) [*beticola*].

In uniform nursery tests in 1943 on 60 lucerne varieties and strains New Mexico Common was equally resistant to wilt (*Phytomonas* [*Corynebacterium*] *insidiosum*) with any of those tested. The disease, which is probably the chief limiting factor in the growth of lucerne in New Mexico, as elsewhere, occurred in a severe form.

In 1942 the following five out of 11 tomato varieties in the order named were outstanding in resistance to western yellow blight [curly top: ibid., xxi, p. 103]: Pearson, Pan America, Nystate, Stokesdale, and Bonny Best.

LEVINE (M.). **Colchicine and X-rays in the treatment of plant and animal overgrowths.**—*Bot. Rev.*, xi, 3, pp. 145–180, 1945.

Colchicin is here treated historically, in relation, *inter alia*, to its effect on plants and animals, to its action in conjunction with X-rays and bacterial filtrates on tumours, and to its use in genetics. Colchicin, applied with lanoline paste to an onion plant infected with *Bacterium tumefaciens* [*R.A.M.*, xix, p. 461] did not arrest the development of the tumour, but, when applied to a well-formed gall, death of the overgrowth ensued. It is stated that crown gall on economic plants may be treated by preventive methods which will avoid the introduction of the causal organisms.

KHRISTOV [or CHRISTOFF] (A.). Бактериалният ракъ по овощнитѣ дървета въ И България. [Crown gall on fruit trees in Bulgaria.]—*Спис. Змед. Опит. Инсти България* [*J. agric. Exp. Stas Bulgaria*], x, 1, pp. 3–27, 2 figs., 1940. [English summary. Received December, 1945.]

Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) of fruit trees is common, and the source of great damage, throughout Bulgaria. The bacterium has been isolated in that country from tumours on greengage, pear, apple, mahaleb [*Prunus mahaleb*], and apricot trees; and artificial inoculations on stems of tomato, sunflower, greengage, pear, and apple with isolations from greengage, pear, and apple, have given positive results. An examination of the rootstocks from 113 specimens of *P.* spp. and varieties from 1932 to 1939 showed that No. 96 (damson) and No. 108 (*P. spinosa*) were completely resistant. Unfortunately, the damson tree has since been destroyed. Of the *P. spinosa* trees, two bore no tumours, but had several small, conical excrescences round the incisions on the main roots, the significance of which as possible symptoms of crown gall requires further investigation.

A bibliography of 155 titles is appended.

WORMALD (H.) & GARNER (R. J.). **An experiment on the control of crown gall on vegetatively raised Apple rootstocks.**—*Rep. E. Malling Res. Sta., 1944*, pp. 73–74, 1945.

In a large-scale test carried out at East Malling in 1938 to test the value of uspulun as a protective against crown gall [*Bacterium tumefaciens*] of apple rootstocks raised by layering or stooling [cf. *R.A.M.*, xix, p. 544; xxii, p. 487], the root systems and stem bases of Malling II rootstocks (as removed from the layer rows) were immersed in a 'slurry' of uspulun and soil, and the rootstocks planted out towards the end of March. The treatments used were, A (½ per cent.), 4 oz. uspulun in 1½ gals. water plus 3½ gals. soil, B (¼ per cent.), 2 oz. uspulun in the same, and C, no uspulun. Of 400 rootstocks subjected to each treatment and lifted in May, 1939, 189 (47·3 per cent.) were alive in treatment A, 173 (43·3 per cent.) in B, and 91 (22·8 per cent.) in C. The numbers of living rootstocks free from galls in the three treatments were, respectively, 99, 84, and 16; the percentages of living rootstocks without galls were 52·4, 48·6, and 17·6, respectively; and the percentages of clean rootstocks out of total treated were, respectively, 24·8, 21, and 4. Even better results would probably have been obtained if the uspulun had been used at a higher concentration.

GRIEVE (B. J.). **II. Studies in the physiology of host-parasite relations. III. Factors affecting resistance to bacterial wilt of Solanaceae.**—*Proc. roy. Soc. Vict.*, N.S., lv, 1, pp. 13–40, 2 figs., 7 graphs, 1943. [Received December, 1945.]

Heavy and rapid infection of potato and tomato plants by *Bacterium* [*Xanthomonas*] *solanacearum* [*R.A.M.*, xxiii, p. 9] is induced by high soil moisture and in dry soil the plants are less susceptible to attack, the positive relationship between soil moisture and disease incidence being indicated by the severity of the disease encountered in the moist soil of the Koo-wee-rup district of Victoria. Optimum conditions favouring a rapid spread of the pathogen in the host comprise durable temperatures falling between 66° and 73° F. with mean light intensity of 800 ft.c. in the glasshouse during the summer months. Plants grown under high humidity showed greater susceptibility than those grown under normal glasshouse conditions. Rate of transpiration did not affect the passage of the pathogen up the vessels. The optimum rate of movement of the organism in the vascular bundles in wet soil at 73° was 5 mm. per hour for potato and 2·2 for tomato. The minimum, optimum, and maximum temperatures for the growth of *X. solanacearum* were 15°,

32°, and 35° C., respectively. Significant differences in height, leaf area, and water content of tomato plants grown in wet as against dry soil were disclosed by physiological and anatomical studies, while the vessels were larger and more numerous. It is believed that increased water content is the factor which materially increases the susceptibility of the plant to invasion.

Franco do Amaral (J.). **Doenças vasculares das plantas causadas por bactérias.** [Vascular diseases of plants caused by bacteria.]—*Biológico*, xi, 9, pp. 250–253, 1 fig., 1945.

A study was made at the Biological Institute, São Paulo, Brazil, of the modes of infection of representatives of two groups of phytopathogenic bacteria, viz., non-specific (*Phytomonas* [*Xanthomonas*] *solanacearum*) and specific (*P.* sp. on cassava) [*R.A.M.*, xxii, p. 465]. The action of the former on potato, tomato, and tobacco consists in a purely mechanical obstruction of the vessels [see preceding abstract], whereas the latter secretes extracellular enzymes which exert a strong amylolytic effect on the starch contents of infected cassava plants. An ammonium sulphate precipitate of a culture filtrate of the cassava pathogen was experimentally shown to retain its amylolytic activity for over a year.

The agents of vascular diseases are disseminated in nature by various means, chiefly agricultural implements. In the case of *X. solanacearum* control may be effected by a tri- to quadrennial rotation, including, for instance, sorghum and soy-bean, which are immune from the wilt, while any other crop will serve to hinder the spread of the cassava disease, resistance to which has been shown at the Campinas Agronomic Institute by the following varieties in the order named: Branca [White] de Santa Catarina, Areal, Brava Preta [Black] de Suriú, and Itú.

Ekstrand (H.). **Höstsädens och vallarnas övervintring vintern 1944–45.** [Autumn cereal and pasture grass overwintering during the winter of 1944–45.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 4, pp. 49–53, 1945.

Snow mould of cereals (*Fusarium* [*nivale* = *Calonectria graminicola*]) was unimportant during the winter of 1944–5 in south and central Sweden [cf. *R.A.M.*, xxii, p. 99], but caused heavy damage in the more northerly districts, often destroying whole fields of rye. The distribution of *Typhula itoana* and *T. borealis* fell within much the same limits. Indications of differences in varietal reaction to these organisms were observed in experiments with wheat and rye, and in one of the tests on the former crop early sowings (21st August) were more severely damaged than late ones (19th September). *T. borealis* also occurred in a destructive form on timothy [*Phleum pratense*] in the far north, the yield of a second-year seed crop at a State experimental farm, for instance, being reduced by 25 to 30 per cent. Clover rot (*Sclerotinia trifoliorum*) was little in evidence, a surprising fact in view of the favourable climatic conditions for the pathogen—a long, mild autumn, with heavy precipitation, and an open winter.

Buchholtz (W. F.). **The 1941 epiphytotics of Puccinia rubigo-vera and Puccinia coronata in South Dakota.**—*Proc. S. Dak. Acad. Sci.*, xxii, pp. 64–66, 1942. [Received January, 1946.]

In 1941 occurred probably the most severe epidemics of wheat brown rust (*Puccinia rubigo-vera*) [*P. triticina*] and crown rust of oats (*P. coronata*) ever observed in eastern South Dakota. The incidence of infection by *P. triticina* on the susceptible Thatcher and the resistant Pilot and Rival varieties was 85, 3, and 2 per cent., respectively, and the yields 15·9, 20·9, and 21 bush. per acre, respectively, the corresponding figures for 1940 being 35, 1, and 1 per cent., respectively, and 35·4, 35·3, and 35·2, respectively. The two susceptible Richland and Miomark and one resistant (Tama) oats varieties showed 80, 80, and 0 per cent. crown rust, respectively, in 1941 and yielded 19, 21·5, and 55·9 bush. per acre, respectively, as

compared with a trace for the two susceptible varieties and 0 for the resistant and 83·4, 89·9, and 90·7 bush. per acre, respectively, in 1940. Official estimates of average loss from oats crown rust in 1941 were 50 per cent. (30 per cent. yield and 20 per cent. quality), the corresponding figure for wheat being 30 per cent. (20 and 10, respectively). Expressed as bushels of feed, these estimates indicate a loss of 23,000,000 bush. oats and nearly 9,000,000 bush. wheat, without reckoning the depreciation in quality.

Weather conditions in 1941 were ideal for rust development, rain falling regularly from 19th May until 13th July and usually being preceded by south winds and followed by one to three days of warm, humid weather. *P. triticina* was collected on 29th May (the earliest record for the State), and *P. coronata* appeared shortly thereafter. Dr. C. O. Johnston identified the races of *P. triticina* from the Nebred, Thatcher, Ceres, Hope, and Triumph varieties as 6, 9, 15, 28, 44, and 105.

Millikan (C. R.). **Studies on soil conditions in relation to root-rot of cereals.**—*Proc. roy. Soc. Vict.*, N.S., liv, 2, pp. 145–195, 12 pl., 3 diags., 1942.

Following increased growth and yield of wheat and oats and reduced severity of root rot as a result of small zinc sulphate dressings applied to Wimmera black fallow soil [*R.A.M.*, xviii, p. 97], investigations were directed to determining the effects of other soil minerals on the growth of cereals in that soil.

Experiments with three root-rot fungi occurring in Wimmera black soil, *Fusarium culmorum*, *Helminthosporium sativum*, and *Curvularia ramosa*, showed that manganese, copper, zinc, and iron were essential for their growth. Amino-nitrogen improved the yields of *F. culmorum* and *C. ramosa*, but caused sectoring in *H. sativum*. The addition of vitamins B, C, and nicotinic acid to the nutrient solution stimulated the growth of *H. sativum*.

Steam sterilization of Wimmera black fallow soil, while improving the growth of wheat considerably, rendered calcium, potassium, phosphorus, manganese, zinc, copper, and nitrogen more available to the plant, thus reducing their response to zinc sulphate applications. A similar result was obtained on Wimmera red fallow soil. Another experiment showed that formalin induced growth similar to or better than steam sterilization.

It was further demonstrated that plants grown on Wimmera red soil contained higher phosphoric acid, zinc, and copper, and lower lime, potash, iron, and manganese percentages than those grown on Wimmera black soil.

Zinc response on Wimmera black soil was destroyed by sterilization but was re-established by inoculating the sterilized soil two months before sowing with bacteria normally inhabiting it. The nutritional level of the plants grown on sterilized black soil reinoculated with fungi and bacteria usually present in unsterilized soil was found eight weeks after germination to be much higher than that of plants grown in unsterilized soil, notwithstanding a decrease in the percentages of phosphoric acid, potash, magnesia, zinc, and manganese.

On Wimmera black wheat stubble soil the increase in plant growth resulting from soil sterilization was relatively far greater than on comparable fallow soil. Similarly the response to applications of mineral mixtures was greater on black stubble than on fallow soils under both field and greenhouse conditions, and up to the heading stage sometimes gave equal or better results in stimulating growth on stubble soils under greenhouse conditions than soil sterilization. This is thought to show that the poor growth of oats or wheat normally obtained on Wimmera black stubble soils is attributable more to the inability of the plants to secure a sufficient supply of nutrients from the stubble soil than to root-rot infection.

The addition of magnesium, copper, cobalt, molybdenum, nickel, and boron to stubble soil mixtures appreciably increased the weight of the matter produced, but depressed the yield when applied to black fallow soil, which suggests that soil

organisms may reduce the amount of nutrients available to the plants by drawing on them for their own vital processes, a competition certain to be serious where the supply of nutrients approaches the threshold value for healthy plant development in that particular soil [ibid., xx, pp. 352, 450].

It is emphasized that the incidence of rainfall in relation to heading under field conditions was found to be fundamental in determining the relative differences in yield induced by mineral treatment, which accounts for the greater relative improvement in growth recorded under greenhouse conditions.

In the field increased growth derived from mineral applications to wheat and oats on Wimmera black soil was accompanied by a significant decrease in root rot, but the relatively less favourable growth increase after mineral applications to Wimmera red soil indicates the importance of determining the particular admixture of nutrients required by a given soil. Root rot in the Wimmera district is regarded as due to a complex of organisms and, unless the soil conditions are comparable, the results of greenhouse pathogenicity tests with selected fungi would have little or no relation to the effect in the field. Furthermore, physiological disorders need to be distinguished from the direct effects of foot- and root-rot fungi and the alleviation of the former decreases the apparent severity of the latter.

Smit (J.) & Mulder (E. G.). **Magnesium deficiency as the cause of injury in cereals.** —*Meded. LandbHoogesch. Wageningen*, xlvi, 3, 43 pp., 12 figs., 2 graphs, 1942. [Received October, 1945.]

In general, the addition of small amounts of magnesium sulphate to the soil sufficed to prevent or cure the Hooghalen or soil acidity [magnesium deficiency] disease of cereals in the authors' experiments in Holland [*R.A.M.*, xviii, p. 240], but in a few instances a supplementary treatment with calcium carbonate was necessary, the latter, however, being insufficient by itself. Using a microbiological method involving the culture of *Aspergillus niger* in a magnesium-free solution, it was ascertained that the fields producing diseased crops almost invariably contained less than 50 γ magnesium for 3 gm. soil, compared with upwards of 100 γ in the same quantity of healthy soil. Both in healthy and diseased soils, however, the available portion of magnesium is a mere fraction of the total quantity present. For example, a highly acid 'field' soil (P_H 4), in which no trace of available magnesium could be detected, was shown to contain 20·4 mg. of the mineral per 100 gm., while the analysis of the same soil left in its normal healthy condition at P_H 5·4 revealed available and total magnesium contents of 200 γ per 5 gm. and 21·9 mg. per 100 gm., respectively.

The data obtained by microbiological and chemical determinations were reflected in the magnesium contents of healthy and diseased plants, the naturally larger quantities in the former being still further increased by soil amendments with magnesium sulphate. Supplementary treatments with calcium carbonate presumably act indirectly by improving the development of the root system and so enhancing its capacity for magnesium assimilation, since neutralization did not materially increase the amount of the element available to *A. niger*.

Steenbjerg (F.). **Kobber i Jord og Kulturplanter. Med særligt Henblik paa Gulspidssyge.** [Copper in soil and cultivated plants. With special reference to yellow tip disease.]—*Tidsskr. Planteavl*, xlv, 2, pp. 259–368, 5 figs., 5 graphs, 1940. [English summary. Received January, 1946.]

Much of the information presented in this exhaustive, fully tabulated survey of the relationship between the copper contents of soils and plants and disorders due to copper deficiency, known as 'reclamation disease', 'yellow tip', and so forth, has already been noticed in this *Review* from other sources, but the following summary of the salient points may be of interest. The disease is definitely attributable

to a deficiency of available copper in the soil [*R.A.M.*, xxii, p. 90], which sinks to a minimum at P_H 5·5 to 6·5; within this range, consequently, the heaviest yield increases are obtained by the addition of copper sulphate. In two years' pot tests on Kenya barley in sandy soil with a high humus content amendments of lime (as calcium carbonate) and more particularly of sulphur, adjusting the P_H to 7·6 and 5·4, respectively, resulted in substantial increases in yield over the untreated series, the outcome of field experiments being on an average comparable.

Grass was shown to be the crop with the maximum capacity to increase the available copper content of the soil on which it is grown. In planning rotations care must be taken to avoid a succession of crops depleting the soil of its copper content through their exorbitant demands on the mineral, root crops, for instance, withdrawing a much larger proportion of the available supply than grains.

Several weeks' or months' drying of soil samples in the laboratory tended to reduce considerably the amount of available copper, which was generally increased, on the other hand, by autoclaving; the loss sustained through desiccation was apparently irreversible, at any rate by subsequent moistening for periods up to ten days. The direct beneficial effects, especially on acid peat bogs, of an admixture of mineral soil from disease-free areas, are probably attributable to an increase in the total and available copper contents, while indirectly the amendment acts by augmenting the water-holding capacity of the soil.

Coke ash was shown by Hudig *et al.* [ibid., vi, p. 51] to contain relatively large amounts of available and total copper [cf. ibid., xxi, p. 134], which is also present in fair quantities in compost, whereas the copper contents of stable and liquid manure are insufficient to justify the use of these fertilizers for copper-deficiency control, except possibly in special cases.

A full account is given of the analytical methods devised by the writer and others for the determination of the copper contents of soils and plants. The order of magnitude of acid-soluble copper per ha. is computed at 0 to 150 gm. in deficient soils, compared with 1,000 to 2,000 gm. or more in those of normal composition, while 'transitional' soils contain 200 to 400 gm. A primary indirect cause of copper deficiency is undoubtedly a high humus content, this substance combining freely with cupric ions and thereby immobilizing the copper so that it cannot be utilized by the plants. Very promising results were obtained in experiments from 1937 to 1939 (still in progress at the time of writing), involving the admixture with the soil of finely ground metallic copper in various forms.

TYLER (L. J.). **Dwarf bunt of winter Wheat in New York.**—*Plant Dis. Reptr*, xxix, pp. 668–669, 1945. [Mimeographed.]

An investigation of a complaint by seedsmen at Perry, New York, that wheat bunt was unusually prevalent in some fields, revealed the presence of dwarf bunt (a race of *Tilletia caries*) [*R.A.M.*, xxi, p. 133; xxiii, p. 10] generally distributed in winter wheat fields in at least four counties of the State, the incidence affecting from a trace to about 20 per cent. of the heads. A spotty infection was noted in most of the fields examined and the Cornell 595 variety appeared to suffer most, particularly in stands grown from seed suitably treated with new improved ceresan, which, however, effectively controlled bunt caused by the smooth-spored *T. foetida*. The area of this outbreak surrounds the town of LeRoy in Genesee County where the organism was collected by Bayles in 1940.

VANDERWALLE (R.). **Une méthode rapide d'inoculation florale du Froment et de l'Orge par Ustilago nuda (Jens.) et Ustilago nuda tritici (Schaf.).** [A rapid method for the floral inoculation of Wheat and Barley by *Ustilago nuda* (Jens.) and *U. nuda tritici* (Schaf.).]—*Parasitica*, i, 2, pp. 58–63, 1 pl. (facing p. 57), 1945.

An apparatus devised by the author for the large-scale floral inoculation of cereals,

and based on the techniques of Moore and of Oort [cf. *R.A.M.*, xviii, p. 792], is described and figured. The container is evacuated by means of a rotary vacuum pump worked by a $\frac{1}{4}$ h.p. motor and the spore suspension introduced into the container by a tube through the base. With this apparatus it was possible to inoculate 180 ears of barley per hour. During 1941, 1,200 lines of winter and spring barley were inoculated with *Ustilago nuda*, many which in ordinary culture show only slight outward symptoms of loose smut giving up to 98 per cent. infection.

Volosky de Hernandez (Dora). **Desinfestantes del 'carbón de la Cebada'.** [Disinfectants of Barley smut.]—*Agric. tec., Chile* (formerly *Bol. Sanid. veg., Santiago*), v, i, pp. 37–47, 1 graph, 1945. [English summary.]

A tabulated survey is given of experiments carried out for four years at one Chilean plant breeding station and for two at another in the control of barley covered smut (*Ustilago hordei*) on the Isaria variety with abavit (200 gm. per 100 kg. seed-grain), copper carbonate (300 gm.), formalin (300 c.c. per 100 l. water), hydrit (Dasco y Cía, Santiago), 100 and 200 gm., mercysol (Mussla, Santiago), 200 gm., and tillantin (Bayer), 250 gm. The best results were obtained with abavit and hydrit, both of which gave virtually perfect control, while mercysol was also effective in every year except one; tillantin was only moderately satisfactory, formalin very erratic, and copper carbonate of little value for the end in view. Notwithstanding the variations in the fungicidal efficacy of the several treatments, the yields from the different plots did not present any remarkable disparities.

Arny (D. C.). **Inheritance of resistance to Barley stripe.**—*Phytopathology*, xxxv, 10, pp. 781–804, 6 graphs, 1945.

Two types of resistance and two of susceptibility to stripe disease (*Helminthosporium gramineum*) were apparent in the barley varieties under observation at the Wisconsin Agricultural Experiment Station [*R.A.M.*, xxiv, p. 497]. Persicum and Brachytic maintained a high level of resistance to the culture used in inoculation tests, some factors for resistance being evidently held in common by these two varieties. In crosses with Oderbrucker resistance appeared to be dominant and three factors were probably involved. The resistance of Lion was incomplete and seemed to be inherited in a different manner from that of Persicum, dominance being indefinite and presumably dependent on a number of factors. The susceptibility of Oderbrucker was probably of a different order from that of Colsess and Iris, since in the crosses Persicum × Iris and Colsess × Brachytic a difference of one major and one modifying factor pair was involved in each case. Marker genes in six of the seven linkage groups present in barley were tested for their relationship to stripe reaction with negative results.

Buchwald (N. F.). **Über Puccinia hordei Otth (Syn. P. simplex (Kcke.) Eriksss. & Henn.) und P. hordei-murini n.n. (Syn. P. hordei Fckl.).** [On *Puccinia hordei* Otth (syn. *P. simplex* (Kcke) Eriksss. & Henn.) and *P. hordei-murini* n.n. (syn. *P. hordei Fckl*).]—*Ann. mycol., Berl.*, xli, 4–6, pp. 306–316, 1943. [Received November, 1945.]

A critical examination of the mycological and phytopathological literature on barley dwarf rust [*R.A.M.*, xv, p. 209] has convinced the author that the widely used designation of *Puccinia straminis* var. *simplex* Körnicke, 1865, is incorrect, the variety in question having been first differentiated by Winter in 1882. The valid name is therefore *P. hordei* Otth, 1871, *P. hordei* Fckl, 1873, being a homonym, and it is consequently proposed to change the designation of the latter to *P. hordei-murini* n.n.

P. hordei Otth (syn. *P. anomala* E. Rostr.) and *P. hordei-murini* are distinguishable on a purely morphological basis, the number of germ-pores in the uredospores of the former averaging 8 to 9, compared with 10 to 12 in the latter, while the proportion of mesospores in *P. hordei* averages 80 and never sinks below 50 per cent., whereas in *P. hordei-murini* the percentage usually lies round about 28 and scarcely ever exceeds 40. On the other hand, the differences between the teleutospore dimensions in the two species are inconsiderable, though those of *P. hordei-murini* are generally rather smaller (mean 46·65 μ as against 53·24 μ in *P. hordei*).

Both the uni- and bicellular teleutospores of *P. hordei* show a common peculiarity of *P.* spp., namely, the longer (56 μ) and narrower (22·7 μ) measurements of those originating on the leaf sheaths in relation to those from the blades (46·9 and 23·5 μ, respectively).

Stoll (A.). **Les alcaloïdes de l'ergot.** [The ergot alkaloids.]—*Experientia*, i, 8, pp. 250–262, 17 figs., 1945. [English summary.]

Contemporary studies on the clinical applications and chemical properties of rye ergot [*Claviceps purpurea*] are reviewed and critically discussed, and a brief account is given of the large-scale operations now in progress in Switzerland for the procurement of the drug by mechanical inoculation of the growing crop [*R.A.M.*, xxv, p. 65].

Welch (A.). **Pythium root necrosis of Oats.**—*Iowa St. Coll. J. Sci.*, xix, 4, pp. 361–399, 9 figs., 1 graph, 1945.

Every year throughout Iowa oats in the seedling and boot stage develop a condition in which the plants are yellow and stunted, while the lower leaves may be brown and dead. At heading time the affected plants appear to recover, but the crop is reduced. The symptoms become most marked when the conditions fail to favour rapid growth.

A detailed study of the disease from 1938 to 1942, inclusive, showed that serious root necrosis was caused to oats each year by *Pythium debaryanum*, this fungus being the predominating organism in infected roots of field-grown oats in the early part of the season. During the first week in May 80 to 90 per cent. of the isolations from field-grown oat seedlings yielded *Pythium*. Successive isolations in late May and early June gave lower percentages of *Pythium* and higher ones of secondary fungi. In no instance during 1938, 1939, or 1940 was *Pythium* isolated later than 25th June.

In greenhouse tests *P. debaryanum* caused serious seed rot and root necrosis at 25° C. and below, infection being particularly serious between 8° and 15°. In 1938 and 1939 the average temperature of the top inch of soil during May was, locally, about 13·5°. Greenhouse tests in artificially infected soil also demonstrated that temperature, size, and age of seed planted, and the application of different amounts of inoculum played important parts in determining the severity of attack.

Of 232 oat varieties tested in artificially infected soil, Coast Black, Black Algerian, Early Red Rustproof, Red Algerian, Ruakura, and Flughafer were the most resistant, though resistance was in no case outstanding. Commercial varieties and wild species with 21 pairs of chromosomes showed more resistance than those with 14 and 7 pairs.

Oats grown in infected soil showed a reduced growth rate and delayed tillering. The oven-dry weight of plants grown in infected soil was about half that of plants in clean soil. Swedish Select oats grown to maturity in infected soil gave about half the yield of plants in clean soil.

The prevalence of *Pythium* on the roots of yellow and green plants in the field was found to depend on the date when the observations were made. If the isolations were made when yellowing was first observed, the yellow plants tended to

give the highest percentage of *Pythium* isolates. The roots of the yellow plants rotted more rapidly than those of green plants, secondary organisms entered speedily, and *Pythium* was isolated at a later date from green than from yellow plants. Nutritional deficiencies increased the injury caused by *Pythium* root necrosis.

Heavy dressings of nitrogen (as sodium nitrate, 200 lb. per acre) and complete fertilizer (6–8–12, 350 lb. per acre) prevented field-grown plants from becoming stunted and chlorotic, the applications making it possible for the plants to produce new roots and so replace the infected ones. Root replacement took place rapidly, and the plants grew vigorously, and appeared to be normal. There was no evidence that the treatment increased resistance. The evidence obtained showed that any factor that retarded plant growth favoured *Pythium* injury but did not affect pathogenicity. Under optimum conditions of growth oats continued to develop apparently normally, in the presence or absence of *P. debaryanum*, but if any factor intervened to limit optimum development, the fungus appeared to become more destructive.

Wilkinson (R. E.) & Kent (G. C.). **Some factors determining the infection of Corn by Ustilago zeae (Beckm.) Unger.** —*Iowa St. Coll. J. Sci.*, xix, 4, pp. 401–413, 3 figs., 1945.

In the experimental production of maize smut (*Ustilago zeae*) [*U. maydis*] in the greenhouse Davis's spiral whorl method of inoculation [*R.A.M.*, xiv, p. 750] was improved by using triethanolamine oleate as a detergent. With sporidia suspended in carrot decoction this gave the best results, while it was also less toxic to the host tissues, more constant in its composition, and gave higher and more severe infection than any other material tested. The sporidial suspension diluted to 1 in 100 with carrot decoction, plus triethanolamine oleate, produced a high degree of very severe infection.

The range of pathogenicity presented by matched pairs of sporidia, when tested on a single inbred line of maize, extended from the production of a few small galls to many large ones or to necrotic areas.

Of 125 monosporidial isolates tested, two were solopathogenic [ibid., xi, p. 363]. Chlamydospores produced by these two were germinated, and single sporidia isolated. Of the 11 monosporidial isolates from chlamydospores of one, three were of one sex, three of the other, and five solopathogenic; of seven monosporidial isolates from chlamydospores of the other, six were of one sex, one of the other, and none was solopathogenic. All seven solopathogenic cultures produced a small pinhead type of leaf gall extremely different from that induced by the 125 normal heterothallic combinations, and normal, large galls at the nodes or the union of leaf blade and sheath. A composite inoculum of eight matched pairs of sporidia was less virulent than the most virulent of the matched pairs.

Livingston (J. E.). **Charcoal rot of Corn and Sorghum.**—*Res. Bull. Neb. agric. Exp. Sta.* 136, 32 pp., 5 figs., 7 graphs, 1945.

Studies carried out in Nebraska on charcoal rot (*Macrophomina phaseoli*) of sorghum and maize [*R.A.M.*, xvi, p. 310; xxiv, p. 96] showed that when these hosts were grown in inoculated soil in the greenhouse the fungus caused both root rot and stalk rot. A soil temperature of at least 35° C. favoured the growth of the organism and one of 42° was most conducive to sorghum seedling blight. The highest percentage of stalk rot in mature sorghum plants in the greenhouse occurred at a soil temperature of 38°. Of various carbohydrates fructose supported the best growth, with glucose, mannose, galactose, and sucrose almost as good. Raffinose and sodium citrate permitted very slow growth and starch slightly better. Peptone was the best nitrogen source, followed by asparagin; urea gave

poor growth. The fungus grew well over a P_H range of 5·0 to 8·0 with an optimum between 6·0 and 7·0, except for the sorghum isolate, which did not respond well to differences in hydrogen-ion concentration. Low soil moisture retarded the growth of the host and favoured both seedling blight and stalk rot.

In the field either moisture or temperature can limit the distribution and severity of the disease. The heaviest damage from stalk rot of sorghum and maize occurred in the south-central counties of Nebraska in 1940, when the total rainfall in July, August, and September was 4·8 in. and the average daily air temperature 24°. The average maximum daily temperatures in July and August (the hottest months) ranged from 30° to 36°, the daily temperatures often being over 38°. Even with these high temperatures, charcoal stalk rot was rare in irrigated fields. It was also hard to find in low areas in fields in eastern Nebraska, where the summer rainfall since charcoal rot was first observed has been at least 9·4 in. The disease has, however, frequently been noted in maize and sorghum on hilly land, particularly near the shoulder of a hill, where the drainage was best. In western Nebraska, where the average summer rainfall is 4·8 in. or less, charcoal rot has not been important. Here, the average air temperature was under 22·5°, which was the lowest average air temperature at which stalk rot developed in south central and southeastern Nebraska. The data also indicated that high moisture (rainfall to 6 in. or above) prevents the development of the rot.

In greenhouse experiments, using Wisconsin soil temperature tanks and seed of Alliance sorghum, seedling blight was greatest in dry soil at 37° and gradually decreased in intensity to 25°, and in wet soil a similar infection curve was obtained except that at 25° there was much more disease than at 28°. Stalk rot of mature plants was greatest at 37°, decreasing at lower temperatures in both wet and dry soils. No stalk rot occurred at 28° or 25° in the wet or at 25° in the dry soil. In further similar experiments with steam-sterilized and chloropicrin-treated soil, the results indicated that the soil microflora considerably retarded the activity of the fungus. Virtually no seedling blight occurred in inoculated soil treated with chloropicrin, though a high percentage of seedlings were killed in inoculated, steam-sterilized soil. With mature plants a similar effect was observed, though it was less marked. In another series of experiments low soil moisture just preceding and during maturity was essential for the development of a high proportion of rotted stalks and sclerotial formation.

M. phaseoli enters the sorghum plant through the roots and passes into the stem, setting up stalk rot. Advance is primarily through the cortical tissues, where rot may become extensive before the stele is invaded. The root does not die until the inner tissues have been destroyed.

Buchholtz (W. F.). **A comparison of dosages of copper carbonate and ethyl mercuric phosphate with chloranil and sulphur as Sorghum seed treatments.**—*Proc. S. Dak. Acad. Sci.*, xxiii, pp. 56–64, 1943. [Received January, 1946.]

Copper carbonate (18 per cent.) at ¼, ½, standard, and double standard dosages and ethyl mercuric phosphate (new improved ceresan) at the same four rates for 1 and 5 per cent. concentrations were compared with chloranil (spergon) and flowers of sulphur at 3 oz. per bush. as treatments against soil- and seed-borne seed-rotting fungi and covered smut [*Sphacelotheca sorghi*: *R.A.M.*, xxiii, pp. 102, 103] of Sooner Milo grain and 39–30–S forage sorghum.

Copper carbonate at all four dosages, spergon, and sulphur gave satisfactory smut control, but new improved ceresan was only partially effective below the standard rates. Copper carbonate, spergon, and new improved ceresan conferred adequate protection on the seed and resulted in good yields, but sulphur exerted a toxic effect which reduced the seedling stand below that of all other lots, treated or controls.

Southwick (R. W.). **Pressure injection of iron sulphate into Citrus trees.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 27–31, 2 figs., 1945.

After stating that iron deficiency, chlorosis, or lime-induced chlorosis is somewhat prevalent in the citrus-growing areas of California, the author describes a liquid pressure injection apparatus designed to be of use in correcting the deficiency. It consists of three 4 gal. airtight iron containers with an opening in the top, a valve stem for applying air pressure, and an outlet pipe extending from the bottom through the top with T couplings and nipples so that four hoses and valves can be connected to the outlet pipe. Attached by a coupling to the end of the hose there is a brass nipple to be screwed into holes drilled in the trees. Air pressure is secured from a small portable air compressor. Liquid pressure injections were applied to some 60 15-year-old Valencia orange trees and about 200 30-year-old lemons. The injection material was dissolved in 1 gal. water and placed in the 4-gal. container, air pressure being applied through the valve stem to between 80 and 100 lb. per sq. in. Four $\frac{3}{8}$ in. holes 4 in. deep were then bored in the trunk at about 10° angle. After they were filled with liquid and the nipples had been screwed in, the hoses were connected, removing as much air as possible, and the pressure was turned on in each hose. It took from 15 minutes to 3 hours for 1 gal. of liquid to pass into a tree. Concentrations of from 30 to 200 gm. ferrous sulphate were used per tree, alone, or in combination with manganous sulphate, zinc sulphate, or copper sulphate.

The results showed that injections of 50 to 100 gm. ferrous sulphate per tree corrected the condition for periods of from two to four years, with an even distribution of iron throughout the tree. Severe injury was occasionally caused to small twigs, the reason for which has not yet been ascertained.

Bain (F. M.). **A progress report on the dying of Limes.**—*Proc. agric. Soc. Trin. Tob.*, xlv, 2, pp. 123–149, 1945.

This inquiry into a possible connexion between the nutritional status of limes and their death from root disease was undertaken in the light of Fennah's findings [*R.A.M.*, xxii, p. 355], and the results suggest that the disease is associated with a lack of balance between the growth period and the length of dormancy, tending to bring about a prolonged shortage of water within the plant. Shade, wind protection, and contour drainings, which favour satisfactory water relations, assist in retarding or preventing the onset of the disease, whilst the absence of such factors is associated with its presence. Leaf analyses revealed higher nitrogen and potash contents and a narrower nitrogen-potash ratio for healthy than for diseased areas. Trees in dying areas show a longer dormant period than those in healthy ones, leading to more luxuriant flowering and this, combined with the lower nutritional status, induces carbohydrate deficiency and starvation of the rootlets. The use of organic matter and fertilizers to redress carbohydrate deficiency in the plants in dying areas is tentatively recommended, pending the results of further laboratory and field study.

Webber (H. J.). **The 'tristeza' disease of sour Orange rootstock.**—*Citrus Ind.*, xxvi, 5, pp. 18–20; 6, pp. 18–19, 20–22, 1945. [Abs. in *Exp. Sta. Rec.*, xciii, 5, p. 595, 1945.]

After reviewing his own and other workers' investigations into 'tristeza' [root rot] of citrus [*R.A.M.*, xxiv, pp. 366, 410], the author expresses the view that the available evidence eliminates as possible causes of the condition incompatibility of the sour orange stock with sweet orange, mandarin, or grapefruit, and the particular variety of sour orange used as stock. It is very improbable that the development of some substance lethal to the sour orange root, or soil or climatic

conditions, or trace-element deficiencies are responsible. The evidence suggests a virus origin.

TOMKINS (R. G.) & ISHERWOOD (F. A.). **The absorption of diphenyl and o-phenylphenol by Oranges from treated wraps.**—*Analyst*, lxx, 834, pp. 330–333, 1945.

Methods are fully described for the estimation of diphenyl [*R.A.M.*, xxiii, p. 252] and ortho-phenylphenol absorbed by oranges from wraps treated with these substances against green mould [*Penicillium digitatum*] infection, and the data resulting from their application to three cases of Jaffa fruit are tabulated. The amounts of diphenyl and ortho-phenylphenol taken up by the fruits from wraps impregnated with 100 mg. of the chemicals were 4 to 20 and 20 to 30 mg., respectively, per 100 gm. peel (= approximately one orange) [see next abstract].

MACINTOSH (F. G.). **The toxicity of diphenyl and o-phenyl-phenol.**—*Analyst*, lxx, 834, pp. 334–335, 1945.

Tests on laboratory animals at the National Institute of Medical Research showed the order of toxicity of diphenyl and ortho-phenylphenol to be very low, and no fear need be entertained of any danger to the health of consumers from the minute quantities absorbed by oranges from wraps treated with these chemicals [see preceding abstract].

ARNDT (C. H.). **Viability and infection of light and heavy Cotton seeds.**—*Phytopathology*, xxxv, 10, pp. 747–753, 1945.,

Seeds of samples of the upland varieties of cotton (*Gossypium hirsutum*) from the harvests of different years in various States were acid-delinted and separated into light and heavy fractions on the basis of their specific gravity. They were then dried, the relative mean weights determined, and seeds of each lot germinated to ascertain their viability and the incidence of fungal and bacterial infection [*R.A.M.*, xviii, p. 105].

The light seeds, the proportions of which in the different samples ranged from 4 to 94 per cent., were rather more subject to internal fungal infection than the heavy ones, the differences in this respect being more considerable in the case of such organisms as *Rhizopus* spp., *Penicillium* spp., *Diplodia* [*Botryodiplodia*] *theobromae*, *Alternaria* spp., and *Aspergillus* spp. than in that of the important seedling parasites, *Colletotrichum* [*Glomerella*] *gossypii* and *Fusarium* spp. (including *F. moniliforme* [*Gibberella fujikuroi*]).

The viability of the light seeds was generally less than that of the heavy ones when the percentage of the former was small, but this disparity between the two groups was largely eliminated when the proportion of light seeds equalled or exceeded that of heavy ones. The author concludes that the general applicability of water-grading for improving seed quality is questionable.

COLEMAN (EDITH). **Autumn fungi at Emerald.**—*Vict. Nat.*, lxii, 1, pp. 4–7, 1 pl., 1 fig., 1945.

On 20th March, 1945, at Emerald, Victoria, the writer observed below black wattles (*Acacia mollissima*) badly infested by wattle goat moth [*Xyleutes d'urvillei* H.S.] larvae an abundance of *Cordyceps gunnii* fructifications, some barely showing above the deep litter of partly decayed vegetation. The length of the stem varied considerably. Where the larvae had been attacked at an early stage of development, and were still some distance from the surface, the stems ranged from 4 to 10 in. in length and the fruit bodies were small, whereas in the case of older larvae, on the point of pupation, the stem was less than ½ in. long and the fructifications

proportionately larger. The size of the burrow corresponded with that of the fruit body, which was completely formed below ground and raised to the surface by the lengthening stipe; it varied in shape from a single club to inch-wide specimens apparently composed of several flattened, confluent, dark olive-green, velvety clubs, $\frac{1}{2}$ to $1\frac{3}{4}$ in. long. Cross sections from the apex of the club revealed copious filiform sporidia emerging through the perithecia, and under high power the eight-spored, glassy asci were clearly visible.

Schenker (P.). **Pilze und Insekten.** [Fungi and insects.]—Abs. in *Mitt. naturf. Ges. Bern.*, N.F., ii, pp. xxviii–xxx, 1945.

Examples of fungus-insect association commonly observed in Switzerland include the yeast beetle (*Cartodere filum*) and *Penicillium glaucum*, and the elm bark beetle (*Scolytus scolytus*) and *Graphium* [*Ceratostomella ulmi*: *R.A.M.*, xxiv, p. 211].

Of recent years some interesting cases of the actual parasitization of insects by fungi have come to the writer's notice. In the autumn of 1943, for instance, *Empusa tenthredini* Fres. developed in a virulent form on the black larva of the beet leaf wasp (*Athalia spinarum*), killing half to two-thirds of the population. An *E.* sp. differing in some respects from *E. aulicae* was detected on *Crambus* sp. on grasses in the Emmental.

Beauveria densa was found attacking cockchafers [*Melolontha melolontha*: ibid., xxi, p. 480] near Berne and Neuenegg in the autumn of 1943, while another species of *Beauveria* destroyed large numbers of *Sitona lineata* and other leaf-margin beetles in a red clover planting in the winter of 1943–4.

Isaria farinosa [ibid., xvi, p. 532] was active in 1942 and 1943 on the anther moth (*Charaeas graminis*), which occurred in epidemic form in the Emmental; the pre-pupal and pupal stages sustained particularly heavy damage. Larvae of the Geometrid *Acidalia herbariata* fed on dried white clover dusted with the conidia of *I. farinosa* died in a fairly short time, the few survivors failing to reach maturity. The fungus, which was also found on larvae of the moth *Tholera popularis* in the open, is readily cultured on beer wort agar, carrots, potatoes, or bread, the phototropic coremia, with orange-reddish bases, reaching 3 to 4 cm. in height; on full and skim milk in Erlenmeyer flasks shielded from the side light these organs grew in great luxuriance and attained a height of 8 cm.

In the summer of 1943, some larvae covered with the white mycelium of *I. farinosa* presented a setose appearance due to the protrusion of the black perithecial beaks, 1 to 2 mm. long, of *Melanospora parasitica* [ibid., xx, p. 560]. The latter fungus, a true parasite, was easily grown on cultures of *I. farinosa*, another *I.* sp., and *B. bassiana*, but not on those of *B. densa*.

Petkov (P.). **Die Bekämpfung der Heuschrecken mit Empusa.** [The control of Locusts with *Empusa*.]—*Int. Congr. Ent., 1938*, 4, pp. 2616–2618, 1939. [Abs. in *Rev. appl. Ent.*, Ser. A, xxxiii, 4, p. 122, 1945.]

During outbreaks of *Calliptamus* (*Caloptenus*) *italicus* in Bulgaria, high mortality was produced among these locusts as a result of infection by *Empusa grylli* [*R.A.M.*, xxi, p. 45]. Experimental evidence demonstrated that the fungus spread rapidly in groups of the locusts, and that healthy individuals became infected when given food contaminated with the brown, pulpy matter found in the hind part of the abdomen of locusts killed by the organism. The development of the fungus was favoured by temperatures of 19° to 27° C. and moderate atmospheric humidity, while mass development in field conditions occurred only in summer. In field tests during August at 18·7° to 27·3°, with a relative humidity of 41 to 81 per cent., spores scattered on plants killed 83 per cent. of the locusts in six days.

Marchionatto (J. B.). **Nota sobre la 'muscardina verde' (Metarrhizium anisopliae [Metch.] Sor.).** [Note on the 'green muscardine' (*Metarrhizium anisopliae* [Metch.] Sorok.).]—*Rev. chil. Hist. nat.*, xlvi–xlvii, pp. 12–14, 1 fig., 1944.

Since 1937, when the 'green muscardine' fungus, *Metarrhizium anisopliae*, was determined on *Schistocerca paranensis* in Argentina, the writer has identified the same organism in different parts of the country as a parasite of *Cirphis unipuncta*, *Prodenius irex*, *Scapteriscus borellii*, and *Diloboderus abderus*. Infected chrysalids of the last-named present a particularly characteristic, spinulate aspect, due to the envelopment of the hairs covering the body by the white columnar coremia. Details of the morphology of the fungus are given.

Colhoun (J.). **The effect of boron on the development of Flax rust.**—*Gdnrs' Chron.*, Ser. 3, cxviii, 3071, p. 191, 1945.

Experiments in Northern Ireland have confirmed the results of those conducted in the United States by Hart *et al.* (*Phytopathology*, xxxiii, p. 1113, 1943) that the addition of boron to the soil does not satisfactorily control the development of flax rust (*Melampsora lini*) [*R.A.M.*, xxi, p. 291] either in the field or greenhouse. Moreover, the leaf tips are damaged, and the damage increases with the concentrations of solutions of borax, when it is applied in this form.

Millikan (C. R.). **Symptoms of copper deficiency in Flax.**—*Proc. roy. Soc. Vict.*, N.S., lvi, 1, pp. 113–117, 1 pl., 1944.

Liral Crown flax and Free Gallipoli wheat plants were grown in copper-deficient water cultures at the Research Laboratory, Burnley, Victoria, wheat being included as a test plant for the elimination of the copper.

The flax plants showed retardation after approximately four weeks, the leaf internodes produced later were short, the leaves thus having a somewhat rosetted appearance, and being much smaller than the controls. They became puckered and very twisted, the stems showing some twisting also. Later the leaves about the middle portion of the stem developed a dark, greyish-green, semi-transparent discoloration at the tips, soon drooped, and died from the tips downwards. The lowest leaves remained apparently normal, but secondary shoots sent out from the bottom soon became chlorotic with small, twisted veins. Finally growth ceased and the plants began to die from the tops.

Van Slogteren (E.) & De Bruyn Ouboter (Maria P.). **Onderzoekingen over virus-ziekten in bloembolgewassen. II. Tulpen. I.** [Studies on virus diseases in flower bulb crops. II. Tulips. I.]—*Meded. LandbHoogesch. Wageningen*, xlv, 4, 54 pp., 62 figs. (39 col.), 1941. [German and English summaries. Received October, 1945.]

Reviewing the historical records of tulip breaking [*R.A.M.*, xiii, p. 446], the authors point out that as long ago as 1637 Dutch bulb-growers knew how to induce this pathological variegation by grafting an infected on to a healthy plant. In Holland the chief agent in the spread of the disease was experimentally shown to be the aphid *Myzus persicae*, *Macrosiphum euphorbiae* [*M. solanifolii*] and *Doralis* [*Aphis*] *fabae* being also implicated to a lesser extent.

An important advance in the study of breaking has been made, consisting in the acceleration of current-season symptoms by very early inoculation, either by means of infected juice or with the aid of aphids, preferably when the length of the shoot does not exceed 5 cm. and in any case before it reaches 10 cm. By this procedure the great inconveniences attaching to the normally lengthy incubation period of the virus can be obviated. Moreover, as in the case of *Narcissus* mosaic, a diagnosis may be made in a day or two with the help of serological methods.

With a view to determining the influence of environmental and climatic factors

on the incidence of breaking, 100 to 200 bulbs of each of ten well-known commercial varieties were planted in 1937 in (1) the west of Holland, (2) the south of France, (3) Canada, (4) in a warehouse at Lisse, and (5) in the open at the same place. To cite some of the resultant data, after two years in the west, the percentages of infection in Pride of Haarlem, Farncombe Sanders, Rauwenhof, Clara Butt, Prince of Orange, Orange King, and Amber were 13·5, 2, 9·1, 10·5, 9, 2·7, 5·5, and 4, respectively, Bartigon, Ellen Wilmot, and Elisabeth being unaffected. After two years in the south of France, only Ellen Wilmot was still sound, the percentages of breaking in the remaining nine varieties ranging from 0·7 in Amber to 41·4 in Pride of Haarlem. It is of interest to note that after the first year in France only 0·35 per cent. infection had developed in Pride of Haarlem, all the other varieties being unbroken, so that the spread of the virus took place almost in its entirety in the second season.

Similarly, in the Westland series there was a marked increase of breaking in the second year, e.g., from 4 to 13·5 per cent. in Pride of Haarlem and from 1·3 to 10·5 in Clara Butt, while Farncombe Sanders and Rauwenhof were still sound in 1938. All the Canadian lots remained healthy throughout the experiment, as also did the offspring of 25 bulbs of each of 23 other varieties. Two lots of the latter planted in Holland, one indoors and another in the field, contracted a low percentage of breaking. Presumably the Canadian plants owed their immunity to the absence either of aphids or of a source of inoculum, both of which were present in the Dutch trials.

The practice of removing tulip inflorescences, either by 'decapitation' or cutting low on the stalk, at the close of flowering as a precaution against 'fire' (*Botrytis tulipae*) may result in the spread of breaking, the latter method being particularly undesirable from this point of view (1·2 to 11·8 per cent. infection).

McWhorter's antithetic virus theory of tulip breaking [ibid., xvii, p. 603] is fully discussed and criticized as introducing additional complications into an already baffling problem. If the variable symptoms of the condition cannot be interpreted simply as differences in the degree of virulence of a single virus and in the reaction to infection of the host protoplasm, then it seems more plausible to postulate the presence of two nearly related strains of the same virus than of two separate entities, the tulip colour-adding and lily latent-mosaic viruses. McWhorter's hypothesis concerning the infection of Asiatic tulips through contact with Madonna lilies (*Lilium candidum*) in Italian gardens [ibid., xvii, p. 42] is also rejected as conflicting with the known facts and necessitating an explanation of the mode of transmission of the two components of breaking.

Roguing of diseased or suspected plants should be carried out before the influx of aphids into the fields, which in Holland coincides with the onset of flowering. 'Dark' breaking is much less easily recognized than 'light', especially on dark-coloured varieties, which should therefore be inspected with extra care. Tulip stocks containing an admixture of broken plants should not be grown in the vicinity of orchards or other crops apt to be frequented by the aphid vectors of the virus agent. Under proper safeguards the cultivation of Rembrandt and other attractive broken tulip varieties may continue to be practised without unduly endangering the health of the even-coloured stocks.

Mushin (Rose). **A bacterial disease of Stocks caused by Phytomonas matthiolae.**—*Proc. roy. Soc. Vict.*, N.S., liii, 1, pp. 192–205, 1 pl., 1941. [Received December, 1945.]

This paper gives a tabulated account of an investigation into a bacterial disease of stocks (*Matthiola incana* var. *annua*) [*R.A.M.*, xvii, p. 459], reported from Brunswick Park, Victoria, in September, 1938.

The plants at first showed light green spots on the leaves, which later became

discoloured, pale green, mottled with dark green, the surface being uneven and puckered. In serious cases the plants became stunted, the stems were sometimes woody, occasionally having dark brown streaks with discoloration of the cortex. The roots remained apparently normal.

The pathogen was isolated from plants in early stages of the disease and inoculated by incision into the Imperial, Ten Weeks, and Nice varieties. On the last-named local necrotic lesions developed, splitting the cortex and stunting growth. One Nice plant, infected by needle, showed in a week light green, roundish spots about 2 mm. in diameter, with puckering of the leaves later, while another showed only small, brownish lesions at the point of inoculation. The Nice variety was the most susceptible. Evidence derived from further inoculations with cultures re-isolated from the artificially infected stocks suggested that young seedlings kept at lower temperatures were seriously susceptible, having either only local brown lesions on stems and leaves, later becoming puckered, or showing light green spots on the leaves around the points of inoculation and scattered irregularly. Following successive re-isolations the green, fluorescent bacterium was identified by means of cultural and biochemical characters. Inoculations on wallflower, lettuce, tomato, and tobacco resulted in the formation of lesions but no dwarfing or deformity.

The organism is a Gram-negative rod, occurring singly or in pairs, 0·75 to 1·1 by 1 to 3 μ, with polar flagella, forming on agar green-fluorescent colonies with entire or lobated edge, liquefying gelatine, alkalizing and coagulating milk, reducing litmus, growing on Uschinsky's, Fermi's and Sullivan's, but not on Cohn's, solutions, facultatively anäerobic, forming ammonia but not indol or hydrogen sulphide, hydrolysing starch feebly, fermenting in peptone media glucose and galactose without gas production, but not lactose, sucrose, maltose, mannite, glycerine, or salicin, fermenting in peptone free media rhamnose, glucose, levulose, galactose, mannose, glycerol, mannite, and acetic, citric, formic, lactic, malic, and succinic acids, with an optimum temperature of 20° to 24° C., a minimum below 0°, and a maximum slightly above 38·5°, a thermal death point of 52°, with a P_H range of 4·4 to 9·5, succumbing to desiccation for 7 days and exposure to direct sunlight for 30 minutes.

The organism is identified as *Bacterium matthiolae* [loc. cit.]. It is considered to belong to the genus *Phytomonas* and is renamed *P. matthiolae*. The inability of the bacteria to attack all strains of stock and their inactivation by less suitable weather conditions suggest that *P. matthiolae* belongs to sub-group II of non-sucrose-fermenters, composed of soil saprophytes and weak plant parasites. The symptoms, inoculation tests, and biochemical reactions disprove the identity of the organism with [*Pseudomonas*] *syringae* [ibid., xviii, p. 257].

Gould (C. J.). **The parasitism of Glomerularia lonicerae (Pk.) D. and H. in Lonicera species.**—*Iowa St. Coll. J. Sci.*, xix, 4, pp. 301–331, 48 figs., 1 graph, 1945.

The fungus hitherto known as *Glomerularia lonicerae* (Peck) Dearness & House, nom. nud., commonly associated with honeysuckle leaf blight [cf. *R.A.M.*, xxiii, p. 331], occurs in Massachusetts, New York, Michigan, Wisconsin, Iowa, Ontario, Quebec, Prince Edward Island, Manitoba, and New Brunswick, and has been reported from Newfoundland. Natural or artificial infection was observed on 33 (22 new) species and varieties of *Lonicera*, while infection tests also showed *Symphoricarpos albus* to be susceptible.

The disease appears in spring on the first leaves, secondary infections occurring during the remainder of the year. Affected leaves are brownish-black and are often rolled and twisted. The first sign of the fungus is a thin, white layer of basidia and basidiospores on the lower surface, often followed by a white, powdery mass of conidia.

Histological examination showed that hyphal masses were generally present in the epidermal cells above the veins or veinlets, but hyphae which protruded above the leaf surface from these masses never bore attached spores.

The basidia, 2·3 to 5·8 (average 4·4) μ broad, emerge from the stomata as straight, cylindrical structures which gradually become semi-circular and touch, or nearly touch, the leaf surface. The four conical sterigmata measure 7 to 16·4 by 1·9 to 4·7 (average 10·3 by 2·6) μ. In very moist conditions, the sterigmata continue to elongate without producing spores. The mature basidiospores are hyaline, uninucleate, and cylindrical, with rounded ends, except for an apiculus at the attached end, and measure 8·9 to 12·9 by 5·2 to 7·5 (average 10·9 by 6·6) μ. The optimum temperature for basidiospore discharge was between 14° and 21° C.; more discharge occurred at relative humidities of 89·9 and 100 per cent. than at lower ones, and the number of basidiospores discharged from an infected leaf section measuring 19 by 9 mm. was estimated at 974, 700 during 91 hours.

The conidia frequently developed in or near areas of basidial formation on similar mycelia. They also emerged through stomata and were borne on branched conidiophores measuring 2·7 to 5·1 μ wide at the top, 5·8 to 8·5 μ at the bottom, and 30·6 to 54·4 μ long. The hyaline, verrucose, binucleate spores formed in clusters of six, in three pairs. Two pairs were spherical and borne on stalks, while the other two spores were elongated, sessile, and developed at the junction of the two stalks. The outer, inner, and elongated pairs measured, respectively, 10·2 to 17, 8·5 to 13·6, and 5·1 to 13·6 by 11·9 to 22·1 μ. The outer pairs were nearly always the only spores to germinate, germination taking place by the formation of binucleate germ-tubes. The minimum, optimum, and maximum temperatures for conidial germination were approximately 2°, 22° to 25°, and 33° to 40°, respectively. Exposure to light decreased germination.

The characteristics of the basidial stage (curved, four-spored, transversely septate basidia emerging through stomata from hyphae within the leaves, not forming hymenia, and developing intracellular masses of mycelium as well as intercellular mycelium) place the fungus in the genus *Herpobasidium*. It differs from both known species, *H. filicinum* and *H. struthopteridis*, and is named *H. deformans* n. sp. (syn. *H. foliodistortum* Gould, nom. nud.) [loc. cit.].

Experimental infection followed exposure to basidiospores, but never to conidia. Infection was favoured by temperatures of 15° to 18°, relative humidity near or at 100 per cent., sustained periods of high humidity for at least two days, and the use of young leaves and lower leaf surfaces. The minimum and maximum temperatures for infection were approximately 1° and 24° to 28°, respectively.

Considerable differences in varietal susceptibility were observed, *L. japonica halliana* being apparently immune.

Garcia (L. A. A.). **Alternaria blight of Bachelor's Button (Gomphrena globosa L.).** —*J. Agric. P.R.*, xxvii, 4, pp. 165–169, 1943.

A severe leaf and stem blight of *Gomphrena globosa* was observed near Río Piedras during the hot, humid summer of 1937, and later became epiphytotic throughout Puerto Rico. A species of *Alternaria* was isolated invariably from affected leaves and from stem tissues of plants in gardens, and also from the wild species *G. dispersa*. The leaf symptoms of this blight correspond with those reported by Togashi from Japan [*R.A.M.*, v, p. 671]. Yellowish-green spots appeared on both leaf surfaces, although more conspicuously on the upper side, and multiplied more rapidly on the lower leaves, enlarging and turning yellowish-brown, and forming concentric rings of varying shades of that colour. The tissues round the yellowish-green spots turned first dull green and later became discoloured. When the lesions ceased to develop, the yellowish-brown spot was seen to be encircled by a characteristic reddish halo. The spots were subcircular and coalesced

on enlarging, covering a great part of the leaf. Later the leaves became corrugated, rolled, and dirty brown and hung down along the stems for several days before dropping off. Some lesions on the stems gradually lost their dahlia-carmine halo and a white discoloured area remained, the lesions coalescing and circling the plant.

The fungus grew well on potato dextrose, prune, bean, and oatmeal agars. On the last-named it formed aerial, cottony, white to grey mycelium and olive-brown or ochrous sporulating hyphae which produced numerous chlamydospore-like bodies. Sporulation occurred on oatmeal agar only and in small amounts. The amphigenously produced conidiophores were 1- to 5-septate, 35 to 70 by 4 to 5 μ and usually bore single conidia. These were elongate, obclavate 60 to 160 by 12 to 16 μ, with a long, unbranched beak, one to three times the width of the spore and septated every 10 to 15 μ.

Plants inoculated with spores washed from typical lesions and from pure cultures developed within three days characteristic, yellowish-green spots, constantly associated with the pathogen.

Excision of dead or severely diseased plants, destruction by deep ploughing and burning of all diseased material, clean cultivation, good drainage, and planting during the dry season are measures recommended to check the disease.

Hardison (J. R.). **Bacterial blight of Orchard Grass observed in Oregon.**—*Plant Dis. Reptr*, xxix, 22, p. 600, 1945. [Mimeographed.]

At the grass nursery of the Oregon Agricultural Experiment Station, specimens of a bacterial head blight of orchard grass (*Dactylis glomerata*) associated with a non-motile, Gram-positive bacterium suggesting Rathay's disease, caused by *Corynebacterium rathayi* [*R.A.M.*, xiv, p. 514; xxi, p. 365] were collected in May, 1945. A yellow bacterial exudate covered much of the spikelets in affected portions of diseased panicles; in some spikelets only one or two of the florets were affected, in others all. This is believed to be the first report of the disease in the United States, but the stunting of plants, abnormal growth, and the susceptibility of the leaves described for the disease in Europe were not observed.

The disease occurred only on the Akoroa strain of orchard grass imported from New Zealand, and was presumably introduced with infected seed, three replications of this strain cultivated in the nursery showing diseased panicles. It is suggested that the disease might be sought in other plantings of orchard grass from New Zealand and European seed, particularly Danish [ibid., xii, p. 294].

Smith (O. F.). **Parasitism of Rhizoctonia solani from Alfalfa.**—*Phytopathology*, xxxv, 10, pp. 832–837, 1 fig., 1945.

At the Nevada Agricultural Experiment Station, California Cómmon lucerne was inoculated with isolates of *Rhizoctonia* [*Corticium*] *solani* from potato, sweet clover (*Melilotus alba*), beet, and cotton, and other plants were inoculated with a strain of the fungus causing lucerne root canker in south-western Arizona and southern California [*R.A.M.*, xxiii, p. 109]. The latter produced numerous root cankers on reinoculation into lucerne, to which the isolates from other plants were innocuous, except one from beet of weak pathogenicity, expressed by a few lesions in four of 40 roots. The lucerne root fungus proved injurious to the roots of Bard vetch (*Vicia calcarata*), berseem clover (*Trifolium alexandrinum*), guar (*Cyamopsis psoraloides*), Hubara and Madrid Evergreen sweet clover, sour clover (*M. indica*), Cumberland red clover (*T. pratense*), and to the stems of Canada field peas.

Cormack (M. W.). **Studies on Ascochyta imperfecta, a seed- and soil-borne parasite of Alfalfa.**—*Phytopathology*, xxxv, 10, pp. 838–854, 2 figs., 1945.

In field, greenhouse, and laboratory studies at Edmonton, Alberta, Canada, *Ascochyta imperfecta*, the agent of lucerne, black stem [*R.A.M.*, xxi, p. 121],

parasitized the roots of its own host and other legumes, as well as lucerne seedlings, and was both seed- and soil-borne. None of the other plants investigated was so susceptible as lucerne to stem, leaf, and root infection by *A. imperfecta*, which caused only slight infection on *Melilotus alba*, *M. officinalis*, and red clover (*Trifolium pratense*), while alsike (*T. hybridum*) was even more resistant. The fungus was occasionally isolated from *Vicia americana* stems and the foliage of *Lathyrus* spp.

Cool, humid conditions favoured the development of black stem on lucerne stems, leaves, and seedlings. The roots of dormant plants were not attacked at soil temperatures near freezing point. The incidence of seed and stem infection was directly correlated. *A. imperfecta* was isolated from up to 40 per cent. of the seeds of 49 out of 97 random samples. The fungus was abundant in the surface soil of lucerne fields, but disappeared two years after ploughing, nor was it isolated from the soil of cereal rotations, virgin prairie, or virgin woods. It persisted on dry lucerne stems and leaves for at least five years, and on the seed for about three. New improved ceresan, diluted to 1 per cent. ethyl mercury phosphate, and arasan were the most effective of the seed treatments tested.

No evidence of host specificity was obtained in these studies, similar differences in virulence and cultural characters being exhibited by isolates from various hosts, different parts of the same plant, and soil.

Among the Ascomycetes found in association with the pycnidia of *A. imperfecta* on overwintered lucerne stems was a *Pleospora* closely resembling *P. rehmiana*, described as the agent of the same disease in Idaho [ibid., xvi, p. 184], but proof of a genetic connexion could not be established and it is concluded that the two states are not related.

Roberts (W. O.). **Leaf painting as a method of diagnosis of mineral deficiency.**—*Rep. E. Malling Res. Sta., 1944*, p. 67, 2 figs. (facing p. 68), 1945.

In tests of the diagnosis of trace-element deficiencies by leaf-painting, peas in an area likely to be deficient in manganese were treated by painting the leaflets on one side of the last fully expanded leaf with manganese sulphate solutions ranging in strength from 0·025 to 5 per cent., plus 0·1 per cent. spreader, the remaining half on the other side of the midrib being left untreated. Each treatment was applied four times. Nine days later, all the four leaves painted with 0·5 per cent. manganese sulphate were a darker green on the painted than on the unpainted side.

When leaves on a cherry tree known to be deficient in manganese were painted with manganese sulphate the best response was obtained at 0·5 per cent. on two occasions.

The method appears to merit further trial as a routine method of diagnosis for trees which do not absorb injected liquid satisfactorily.

Roberts (W. O.). **Combined mineral deficiencies in fruit trees.**—*Rep. E. Malling Res. Sta., 1944*, pp. 64–67, 1 map, 1945.

In recent years, a serious deficiency of potassium, combined, in most cases, with a deficiency of one or more trace elements, has caused a die-back of apple, pear, and plum trees in widely separated areas of eastern and southern England. Leaf analyses supported this diagnosis and showed the trees to be low in potassium, iron, and/or manganese, while in six cases boron was low. Three stages in the condition were noted on apple in 1944: (1) the leaves were small, brittle, grey-green, the fruit was usually small, the young wood was grey, and growth was often poor, the tree progressively losing its lustrous, healthy appearance; (2) the basal leaves of extension growths became discoloured, and showed marginal scorch and rotting; there was internal chlorosis of spur and other leaves, and a yellowing of leaves at the tips of extension growth shoots; branches about to die showed a blistering and wrinkling of the bark, which was of a very unnatural colour; and

(3) rapid die-back set in. On pear, the leaf edges turned dark brown or black, the leaves were small and brittle, and the edges were curled parallel to the midrib; some had a pinkish hue. The bark became blistered and showed an unhealthy colour, and when lifted, revealed a blackened area round the base of the leaf stalk.

It is considered that the potassium deficiency results from the war-time shortage of potassic manures, while the trace-element deficiencies are due to the calcareous nature of the soils or to calcareous applications and low organic matter.

Preliminary experimental injections of the necessary nutrients in solid form have given encouraging results and further trials are to be made in an attempt to find a rapid cure.

Garner (R. J.) & Roach (W. A.). **Comparative susceptibilities of certain horticultural and agricultural plants to trace element deficiencies.**—*Rep. E. Malling Res. Sta., 1944*, pp. 70–73, 2 figs., 1945.

When 13 different kinds of crops were grown on a highly calcareous peat, they showed a wide range of susceptibility to trace-element deficiency. The most outstanding difference was between potatoes and oats on the one hand and willows (*Salix vitellina* '*goldenensis*') on the other. The potatoes and oats were severely affected by manganese deficiency, and the willows, also severely, by iron deficiency, though their symptoms were characteristic of manganese deficiency in fruit trees. Boysenberries [*Rubus ursinus* var. *loganobaccus*] showed symptoms characteristic of iron deficiency in fruit trees, but were proved to be affected by manganese deficiency. An inverse relationship was observed between severity of symptoms and yield of crop in potatoes, oats, peas, and willows. The results suggest caution in the use of indicator plants in diagnosing deficiencies in plants not exhibiting specific symptoms.

Thompson (S. G.). **The cure of deficiencies of iron or manganese.**—*Rep. E. Malling, Res. Sta., 1944*, pp. 119–123, 1 fig., 1945.

In this paper the author discusses in popular terms the methods that growers can adopt for curing iron or manganese deficiency in apples, pears, plums, cherries, and peaches. Soil applications are of little or no value, and the choice lies between injections and sprays. Both are effective, and which should be adopted depends on the circumstances and on a number of considerations which are reviewed.

Boynton (D.). **Studies on the control of magnesium deficiency in New York Apple orchards.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 1–5, 1945.

In spraying tests carried out on Baldwin apple trees against leaf blotch due to magnesium deficiency, the data obtained indicated (from leaf analyses) that two cover sprays including 16 lb. high magnesium hydrated lime (30 per cent. Mg O) per 100 gals. water were as effective in increasing leaf magnesium as two sprays including 16 lb. Epsom salts [magnesium sulphate]. Such a heavy dosage of spray lime leaves a white deposit on the leaves and young fruits, and may decrease the effectiveness of arsenicals.

Southwick (L.) & Smith (C. T.). **Further data on correcting magnesium deficiency in Apple orchards.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 6–12, 1945.

In further work carried out in Massachusetts on the effects of spray and soil applications of magnesium on magnesium-deficient apple trees [*R.A.M.*, xxiv, p. 322; see also preceding abstract], the inclusion of 20 lb. Epsom salts [magnesium sulphate] per 100 gals. spray in three early-season applications to some extent prevented the development of 'leaf scorch' in the year of application. This treatment appeared to be particularly valuable for trees slow in responding to soil applications of magnesium. As a temporary means of controlling magnesium deficiency it has a definite place, especially in mature orchards.

Soil applications of Epsom salts and kieserite were advantageous in young mulched blocks, but one application of dolomite, kieserite, or Epsom salts was ineffective in a seriously deficient bearing orchard under sod culture. Commercial magnesium oxide (92 per cent. Mg O) appeared to give greater increases of magnesium in leaves of young apple trees than did Epsom salts applied in similar amounts by weight. Commercial dolomite [magnesium limestone] appeared to be less beneficial than other materials, except when applied together with Epsom salts.

Chucka (J. A.), Waring (J. H.), & Wyman (O. L.). **Magnesium deficiency in Maine Apple orchards.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 13–14, 1945.

After pointing out that in Maine apple 'leaf scorch' and 'magnesium deficiency' are commonly used as referring to one and the same condition, the authors briefly describe investigations carried out to determine the cause and possible control of the trouble. The data obtained indicated that apple orchards on soils low in magnesium should be treated preventively with dolomite limestone. Orchards already affected by leaf scorch should be similarly treated, and, in addition, should receive sprays containing 20 lb. Epsom salts [magnesium sulphate] of spray material per 100 gals. until the magnesium in the limestone applied has become available.

Beakbane (A. Beryl) & Thompson (Eleanor C.). **Recognition of 'rubbery' condition in Lord Lambourne and some other Apple varieties.**—*Rep. E. Malling Res. Sta., 1944*, pp. 108–109, 1 fig., 1945.

A staining method for detecting 'rubbery wood' [*R.A.M.*, xxiv, p. 423] (the cause of which has not yet been determined) in Lord Lambourne and certain other apple varieties is described. As much solid phloroglucinol as will go on a sixpence is added to two-thirds of an eggcupful of water, and the solution then added to one-third of an eggcupful of concentrated hydrochloric acid. A cross-section of the stem, about $\frac{1}{4}$ in. thick, is cut off. The bark is removed with the thumb nail and the section placed in a glass dish and covered with the solution. Normal wood becomes red all over after about five minutes, whereas 'rubbery' wood displays white areas. As the abnormality is not readily detected without the aid of a microscope in thin, one-year old lateral shoots, it is advisable, when examining orchard trees, to test wood two years old or more. If the test is used to survey nurseries of maiden trees, sample maidens should be tested at the base of the scion shoot, the symptoms being much more difficult to detect at the top.

Pieniazek (S. A.) & Christopher (E. P.). **Effect of pre-storage treatments on the incidence of scald of Rhode Island Greening Apples.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 123–130, 1945.

Studies in the control of storage scald of Rhode Island Greening apples [*R.A.M.*, xxiv, p. 444] showed that delayed storage, the fruits being maintained for 10 or 20 days at 78° F., prevented the trouble, but in most cases impaired the flavour [cf. next abstracts]. Ammonia and acetic acid vapour, used as short pre-storage treatments, were without effect on scald, but sealing in tight jars for a few days at storage and room temperatures before storage usually prevented scald provided the treatment was sufficiently prolonged. Pre-storage in atmospheres of 30 and 60 per cent. carbon dioxide at room temperatures for one to four days gave some control of scald, but the results were not uniform. Similar pre-storage treatment at 32° for three, six, and ten days gave very good control with no loss of flavour. No recommendations are given on these experiments, as further data are required.

Esbjerg (N.). **Opbevaringsforsøg med Æbler og Pærer af Høst 1938 og 1939. Forsøg med Opbevaring under forskellige Lagerforhold II.** [Preservation experiment with Apples and Pears of the 1938 and 1939 harvests. Experiments in preservation under various storage conditions II.]—*Tidsskr. Planteavl*, xlv, 4, pp. 565–622, 6 figs., 1941. [English summary. Received January, 1946.]

Further experimental data are summarized and tabulated in connexion with the health of apples (pears also being included in the present series of trials) under various storage conditions in 1938–9 and 1939–40 in Denmark [*R.A.M.*, xviii, p. 118 and preceding and next abstracts], viz., an ordinary ventilated storeroom and a cold store at temperatures of 3·5°, 2·5°, 1·5°, and (in the latter year) 0·5° C., while the effects of pre-cooling (by keeping the fruits at 2·5° for 10 or 20 days before placing in the ventilated storeroom) and of delayed cooling (10 or 20 days in the ventilated storeroom before transference to the cold store) were also determined.

Ten days' pre-cooling and cold storage improved the keeping properties of Bellefleur de France apples of the 1938 harvest until January or February, but by March or April the position had deteriorated in respect of scald and low-temperature breakdown, which were more severe in cold than in ordinary storage, while brown heart occurred only under the former conditions. In 1939 scald and brown heart were again more troublesome at the lower temperatures in the cold store during the latter part of the storage period. In contrast to 1938, delayed cooling improved the keeping properties of Bellefleur.

Both in 1938 and 1939 Bismarck kept best at low temperatures. In the former year, brown heart affected all the fruits in each series, while in the latter it was reduced under the influence of the lowest temperatures of 1·5° and (more especially) 0·5°. The maximum incidence of fungal infection (21 per cent.) occurred in 1938 in the ordinary storeroom without pre-cooling, *Botrytis* [*cinerea*], *Penicillium*, and *Gloeosporium album* being the organisms mainly concerned.

Blenheim was likewise benefited by cooling and pre-cooling in both years, except in respect of brown heart, which was aggravated at low temperatures. Scald occurred in the ordinary storeroom in both seasons, Jonathan spot in 1938–9 only.

In both years scald was more severe in Filippa in the ordinary storeroom and Jonathan spot in cold storage. Fungal infection was present under the former conditions, especially in 1938–9, but was greatly reduced by pre-cooling.

Gravenstein sustained severe injury from low-temperature breakdown in cold storage, while brown heart was also destructive under similar conditions, especially in 1938–9. In both years scald was more prevalent in ordinary, and Jonathan spot in cold storage. Fungal infection in the ordinary storeroom was reduced by pre-cooling in the former year, while in the latter it was relatively unimportant.

Nonnetit suffered heavy damage from Jonathan spot in cold storage especially in 1939–40 and without a preliminary period in the ordinary storeroom; in 1938–9 the trouble was intensified by pre-cooling. Scald was severe in the ordinary storeroom in the earlier year, especially where cooling was omitted.

In both seasons pre-cooling enhanced the keeping properties of Pederstrup, while delay in exposure to low temperatures impaired them. Scald and Jonathan spot occurred in the ordinary storeroom in both seasons, the latter also to a slight extent in the cold store in 1938–9.

Scald was prevalent in the Sønderskov variety in the ordinary storeroom, especially in the absence of pre-cooling.

In nearly all the tests on pears the advantages of cold storage were manifest, but the difficulty of achieving satisfactory results is much greater than in the case of apples, and a number of critical points remain to be settled before proceeding with the method.

Esbjerg (N.). **Forsøg med Opbevaring af Æbler og Pærer i Kulsyrerum og andre Lagerrum 1936–41. Forsøg med Frugtopbevaring under forskellige Lagerforhold III.** [Experiments in the preservation of Apples and Pears in gas storage and other storage rooms 1936–41. Experiments in fruit preservation under various storage conditions III.]—*Tidsskr. Planteavl*, xlvi, 3, pp. 426–494, 8 figs., 3 diags., 1942. [English summary. Received January, 1946.]

From this very full discussion, amplified by 46 tables, of the comparative incidence from 1936 to 1941 of various storage diseases on a number of standard apple varieties held in gas, cold, and ordinary storage [see preceding and next abstracts], it would appear that Nonnetit, Filippa, Gravenstein, Bramley's Seedling, and Codling Springrove are the best adapted for keeping in gas storage.

Esbjerg (N.). **Forsøg med Præservering af Æbler. Forsøg med Frugtopbevaring under forskellige Lagerforhold IV.** [Experiments in Apple preservation. Experiments in fruit preservation under various storage conditions. IV.]—*Tidsskr. Planteavl*, xlvii, 2, pp. 306–325, 1942. [Received January, 1946.]

Various preparations were tested between 1934 and 1941 for their applicability to the skin of apples as a means of combating storage disorders in Denmark [see preceding abstracts]. Gerner's solution, consisting of shellac, castor oil, paraffin oil, and sandarac dissolved in alcohol and methyl alcohol, appreciably reduced the incidence of fungal infection, but increased that of brown heart and gave conflicting results in respect of Jonathan spot and scald. In a small-scale trial to determine the relative merits of 2 per cent. paraffin, cod liver, sunflower, and soya oil emulsions as coatings for Bellefleur de France apples, sunflower was the most effective and paraffin the least, the former practically equalling the standard oiled paper wraps. The results of the experiments with sterisol (chloramine) and diatomol were inconclusive or unsatisfactory.

Smolák (J.). **Příspěvek k poznání sklovitosti Jablek.** [A contribution to the study of water-core disease of Apples.]—*Rozpr. České Acad.*, liv, 26, 12 pp., 1 col. pl., 16 figs., 1945. [With a shorter English version in *Bull. int. Acad. Prague*, liv, 4 pp., 1 col. pl., 7 figs., 1945.]

This study of the cytology and etiology of the water-core disease of apples [*R.A.M.*, xix, pp. 290, 353] revealed the presence of a bacterium in affected tissues, which the author regards as the agent of the disease and names *Bacterium mali* [without a diagnosis].

The intercellular spaces in the affected tissues of the diseased apples were much larger than in healthy fruit and the nuclei of the part attacked sometimes assumed an irregular or amoeboid form as if corroded. The diseased tissue behaves as if parasitized and morphologically resembled gall-tissue. The enlargment of the intercellular spaces is attributed to their being filled with a curious zoogloea, containing immense numbers of bacteria, which are considered to expel the air and occupy its room in the intercellular spaces. This occurrence of bacteria-filled zoogloeae was observed in all the watery parts of affected fruit. Isolation experiments yielded on many occasions a short rod rounded at the ends and slightly bent, morphologically identical with that observed in the intercellular spaces. The crowded colonies, with a faint yellowish tinge, become visible after 36 hours. Only one attempt to inoculate a healthy apple with the organism has so far succeeded, but nevertheless the author believes the disease is a form of bacteriosis.

Wormald (H.). **A black Apple rot caused by Monilia cinerea.**—*Rep. E. Malling Res. Sta., 1944*, pp. 75–76, 1 fig., 1945.

A fungus isolated from an apple affected by black rot, when inoculated into apples, pears, and damsons gave rise to fructifications of *Monilia cinerea*

(*Sclerotinia laxa*). A further experiment demonstrated that the fungus produced the black-apple condition on Bramley's Seedling kept in the dark, but not on King Edward apples even when kept in the dark. Black rot, therefore, may be caused not only by *S. fructigena* but also by *S. laxa*.

[This paper is reprinted from *Gdnrs' Chron.*, Ser. 3, cxvii, p. 115, 1945.]

Thompson (S. G.) & Roberts (W. O.). **Progress in the diagnosis and cure of mineral deficiencies in Cherries.**—*Rep. E. Malling Res. Sta., 1944*, pp. 60–63, 3 figs., 1945.

Experimental evidence indicated that a winter (February) spray of (say) 5 per cent. manganese sulphate gives better control of manganese deficiency of cherries in the current season than does a summer spray, but the effect is no longer apparent after one year.

A second experiment concerned cherries with multiple deficiencies. The foliage was a dull yellow with no pattern, and no scorching or necrosis. Analysis of leaf material indicated that iron, manganese, and zinc were low, calcium high, and potash and phosphorus normal. A branch injected with solid iron sulphate in June, 1944, still showed improvement in the early summer of 1945, as did manganese- and zinc-injected branches, though one injected with boron made no progress. Leaves from branches injected with iron, manganese, and zinc all showed chlorosis, which differed with the treatments. A branch injected with iron plus manganese had foliage of a better colour than that produced by either element alone, but a slight deficiency pattern was present. A branch injected with iron, manganese, zinc, and boron in 1944 showed striking improvement, with no sign of chlorosis and a full crop, whereas the rest of the tree was still very chlorotic. New growth occurred in 1945 on the branches injected with iron, manganese, zinc, and boron together, iron and manganese, and iron alone, while no growth followed manganese only. The view was taken that iron was the main deficiency, manganese secondary, and zinc a minor deficiency. A series of trees was, accordingly, given whole tree injections of iron, manganese, and both together, while two other series received dormant sprays of iron and manganese. So far, the injections of iron plus manganese have given the best results, both iron and manganese alone have given great improvement, iron sprays have resulted in some improvement, and the manganese sprays appear to have had no effect. It is pointed out that diagnosis by leaf symptoms alone may lead to serious errors in cases of complex deficiencies and other means of diagnosis are desirable under these circumstances.

Gerhardt (F.), English (H.), & Smith (E.). **Cracking and decay of Bing Cherries as related to the presence of moisture on the surface of the fruit.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 191–198, 7 graphs, 1945.

The cumulative effect of rains over a four-day period at harvest caused a progressively greater amount of cracking in Bing cherries the longer the fruit remained on the tree. Increased decay (associated with *Alternaria* sp., *Botrytis cinerea*, *Cladosporium herbarum*, *Penicillium expansum*, *Rhizopus* spp., *Sclerotinia fructicola*, and other fungi) and the loss in weight of the rain-damaged fruit after picking were directly correlated with intensity of cracking and time of harvesting. The process of healing of cracked cherries is largely a drying-out of the exposed tissue and not a true healing-over by cork formation. No 'healing' occurred during storage at 40° F. for ten days.

The condensation of moisture (sweating) on the surface of cherries moved from a cold to a warm atmosphere is generally thought by warehousemen to favour decay, but such condensation on Bing cherries kept at 40° did not increase rotting, though short periods at 50° without sweating caused significant increases. The failure of sweating to increase decay is explained by the fact that the moisture on the surface

of the fruit was not retained long enough to permit the germination of fungus spores. Hydro-cooling with iced water at 32° for 30 minutes did not injure the fruit, the appearance of which resembled that of cherries cooled in air at 32°, with a relative humidity of 85 per cent.

RHOADS (A. S.). **Symptom expression of rusty mottle in Utah Sweet Cherry orchards.** —*Plant Dis. Reptr.* xxix, 22, pp. 613–614, 1945. [Mimeographed.]

A survey of Utah sweet cherry orchards in September, 1944, disclosed a necrotic spotting of the leaves so slight as to cause doubt as to whether the characteristic symptoms of rusty mottle [*R.A.M.*, xx, p. 25: xxiii, p. 391] were actually present. It was followed, however, in mid-June of 1945, after a growing season delayed by prolonged cold, rainy weather, by an onset of the disease so severe that large portions of the leaves were killed as a result of profuse spotting, which rapidly became confluent. It is concluded, therefore, that an apparently negligible occurrence of the characteristic necrotic spotting on leaves of Utah sweet cherries justifies a diagnosis of attack by the cherry rusty-mottle virus.

WORMALD (H.). **Strawberry leaf blotch fungus.**—*Rep. E. Malling Res. Sta., 1944*, pp. 76–77, 1945.

This is a reprint of a paper on *Zythia fragariae* already noticed from another source [*R.A.M.*, xxiv, p. 24].

HARRIS (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1944*, pp. 26–28, 1945.

The following items may be noted from this report [*R.A.M.*, xxiv, p. 137]. Tests of Lloyd George raspberry stocks carried out at East Malling in 1943 did not reveal the presence of any free from virus, and suggested the existence of an unsuspected virus carried by this variety, which produced leaf-curling and dwarfing symptoms on Baumforth's Seedling B. Tests of the virus reactions of four additional seedling varieties were begun, together with further work on those of Norfolk Giant. The testing and maintenance of selected stocks of commercial strawberry varieties were continued. Among the newer varieties, Early Cambridge was sensitive to yellow edge [loc. cit.], while Perle de Prague was intermediate.

SUIT (R. F.). **Control of spur blight of red Raspberries.** —*Bull. N.Y. St. agric. Exp. Sta.* 710, 14 pp., 2 figs., 1945.

During investigations conducted from 1938 to 1944 into the incidence and control of spur blight (*Didymella applanata*) [*R.A.M.*, xxii, p. 290], a disease causing at times severe losses in New York State, three years' data showed Indian Summer and Taylor varieties as very susceptible, Newburgh, Latham, and Milton moderately susceptible; and Ontario, Viking, Cuthbert, Marcy, and Chief slightly susceptible.

Under proper cultural methods, carefully carried out with a view notably to assuring that the plants in respect of spacing and the location of the planting to air drainage are able to dry off readily after rainy weather, no fungicidal control is required by the least susceptible varieties.

In the case of susceptible varieties, two applications of fermate, 2–100, the first when the new shoots were some 12 in. high and the second a fortnight later, gave perfect control on Indian Summer. U S K. No. 604, 1 in 100, or ½ in 100, and dithane 1 in 100, gave excellent control but are only available for experimental work. If fermate is not obtainable, the next best treatment is elgetol at 1 per cent. applied at the green-tip stage in the spring, which should reduce disease occurrence except with Indian Summer, and subsequent treatment with Bordeaux mixture, 3–3–100, when the new shoots are about 12 in. high, increased control. Cover

sprays, such as fermate, should be directed at the new shoots, care being taken to avoid the fruiting cane as far as possible.

Kunkel (L. O.). **Studies on Cranberry false blossom.**—*Phytopathology*, xxxv, 10, pp. 805–821, 3 figs., 1945.

The cranberry false-blossom virus [*R.A.M.*, xxiii, p. 317] was transmitted by dodder (*Cuscuta campestris*) from its own host to 28 species of plants belonging to ten families, including parsnip, celery, parsley, carrot, *Vinca rosea*, *Phlox drummondii*, *Petunia hybrida*, tomato, tobacco, *Nicotiana glutinosa*, *N. langsdorffii*, *N. rustica*, potato, *Scabiosa atropurpurea*, *Gaillardia aristata*, *Tagetes erecta*, *Calendula officinalis*, and salsify (*Tragopogon porrifolius*). It was transmitted by the same agency from *V. rosea* and tomato to cranberry. The virus was retained by dodder growing on healthy plants over a two-year period, and apparently multiplies in this vector. Transmission was further effected by grafting to *V. rosea*, Turkish tobacco, tomato, potato, *N. glutinosa*, and *N. rustica*, but not by means of juice from diseased plants, by the aster leafhopper (*Macrosteles divisus*), or through dodder seeds produced by the parasite in the course of growth on an infected tomato plant.

Symptoms of the yellows type developed in all the species to which the false-blossom virus was conveyed, while many also showed signs of gigantism in the flowering and fruiting organs, and sterility was a feature of infected potatoes.

In *V. rosea* and cranberry false blossom was cured by heat treatments [ibid., xxi, p. 340], an eight-day exposure to a temperature of 42° to 43° being recommended, for the latter host.

It is thought probable that cranberry false blossom is closely related to tomato big bud in the United States and Australia [ibid., xxii, p. 457], 'stolbur' [big bud] of the same host in the U.S.S.R. [ibid., xiii, p. 133], and little leaf of eggplant in South India [ibid., xix, pp. 61, 259].

Ivanoff (S. S.). **Deterioro interno no parasitario de la Piña.** [Non-parasitic internal breakdown of Pineapple.]—10 pp., 3 figs., Mexico [City], Secretaria de Agricultura y Fomento, 1945. [Mimeoprinted.]

Pineapple fruits sent by rail from Mexico to the United States often develop on arrival or subsequently a non-parasitic internal breakdown, which renders them worthless. The author studied the disease at Loma Bonita, Oaxaca, the chief pineapple-growing area of Mexico.

Affected fruits generally appear normal on the outside, but are discoloured internally. The first symptoms are slight, water-soaked spots at the base of the fruitlets, resembling in cross-section the size and form of a watermelon seed. The affected tissue enlarges and darkens to a light to very dark chocolate colour. The enlarged area of diseased tissue, which at first is relatively firm, may extend to the core and outwardly towards the rind. The core may darken, but generally remains unaffected. The darkened fruit may soften to a watery consistency, and in the final stages it disintegrates.

A test was carried out in which Cayenne pineapples were harvested at three different stages of progressive ripeness, 'tres-cuartos', 'sazona', and 'pintona', and some of each lot dipped in dithane-zinc-lime solution (dithane 2 qts, zinc sulphate 1 lb., lime ½ lb., and water to 100 gals.), or in water, while others remained untreated. A very few were dipped in Du Pont IN-200[3] suspension and in paraffin. 'Sazona' fruits were treated in addition with benzoic acid-alcohol solution (benzoic acid 2·59 [per cent.], alcohol 30 c.c., water 70 c.c.), by smearing the cut stem end. Some of the fruits were loaded in an ordinary box car, others in an iced car, while the remainder were stored at room temperature. During the ten days' transit from Loma Bonita to Laredo, Texas, the temperature in the iced car ranged from 7° to 25° (average 15·1°) C. and that in the box car from 11° to 28° (average 20°).

On arrival, breakdown was most common in the untreated lots in the box car, the figures for the 'tres-cuartos', 'sazona', and 'pintona' fruits being, respectively, 76, 51, and 23 per cent. With one, probably insignificant exception, all the lots, both treated and untreated, showed less breakdown in the iced than in the uncooled car. Twenty days after loading, however, the fruits in the iced car showed greater damage than those in the uncooled one, the differences being greater in the 'tres-cuartos' fruits than in the more mature ones. On the whole, the fruits treated with dithane-zinc-lime showed less breakdown than untreated, as did fruits dipped in water. The benzoic acid-alcohol treatment appeared to have no significant effect on breakdown.

In the fruits kept at room temperature, the 'tres-cuartos' showed more decay (apparently not internal breakdown) than the others, in all treatments. The dithane-zinc-lime 'sazona' fruits showed much less decay than untreated fruits. The benzoic acid-alcohol treatment and the water-dip of 'sazona' fruits considerably reduced decay. Fruits treated with paraffin or Du Pont IN-200[3] showed no decay after 20 days.

The condition appears to be associated with stage of maturity at harvest and temperature in transit. Greener fruits are more susceptible after transit at low temperatures than more mature ones. The lower temperatures of the iced car reduced the trouble, but these fruits, if kept for a week or ten days at room temperature, seemed to break down more rapidly than uncooled ones. Treatment with benzoic acid-alcohol solution should be continued, against fungal rots. Pineapples sent by boat arrived in Texas in fairly good condition after three to four days' transit at a uniform temperature. Such shipments avoid exposure to the low temperatures of the Mexican plateau and are of much shorter duration than rail shipments, which take eight or nine days.

Hopkins (E. F.), Pagán (V.), & Ramírez Silva (F. J.). **Iron and manganese in relation to plant growth and its importance in Puerto Rico.**—*J. Agric. P.R.*, xxviii, 2, pp. 43–101, 10 figs., 9 graphs, 1944.

Studies [which are fully described] carried out in Puerto Rico on the toxicity of manganese to plant growth and on the mechanism by which iron antidotes this toxicity showed that pineapple soils may contain, locally, up to 130 p.p.m. water-soluble manganese and no water-soluble iron. Pineapple plants growing in these soils require to be sprayed with iron sulphate to prevent severe chlorosis and death [*R.A.M.*, xx, p. 565].

One reason for the presence of high amounts of soluble manganese in the soil is the continued use of ammonium sulphate, which frequently reduces the P_H value of the soil to 4 or under. Adjustment of this figure to 6·2 immobilized the manganese or made it insoluble to such an extent that the available iron sufficed to antidote its toxicity as regards chlorosis. The addition of iron in organic combination improved the condition still more.

To detect conditions conducing to manganese toxicity in soils, common bean [*Phaseolus vulgaris*] plants were grown in them, and in 10 days, when the first trifoliate leaves opened, symptoms of chlorosis appeared, and the approximate severity of the condition was determined.

Extensive water cultures and sub-irrigation gravel culture experiments were made with beans, tomatoes, and pineapples. Chlorosis, necrosis, sun scald, and decreased growth were strikingly associated with low iron and high manganese content.

Sinha (S.). **Studies in the diseases of Mangifera indica Linn. V. The structure and development of lenticels in the Mango fruits.**—*J. Indian bot. Soc.*, xxiv, 3, pp. 119–127, 29 figs., 1 pl., 1945.

This paper describes the structure and development of lenticels in the mango,

based on the examination of epidermal peelings obtained after soaking the tissues in various solutions [*R.A.M.*, xi, p. 658].

PARRIS (G. K.). **The nematocidal and fungicidal value of D-D mixture and other soil fumigants.**—*Phytopathology*, xxxv, 10, pp. 771–780, 1945.

Disappointing results were given by attempts at the Virginia Truck Experiment Station to eliminate the damping-off fungi of spinach and peas, *Rhizoctonia* sp. (probably *R.* [*Corticium*] *solani*) and *Fusarium* sp. (? *F. martii*), *Pythium aphanidermatum*, the agent of post-emergence damping-off of beans [*Phaseolus vulgaris*], and the tomato-wilt fungus, *F. oxysporum* f. *lycopersici* [*F. bulbigenum* var. *lycopersici*], from various types of soil ranging from Norfolk loamy sand to Woodstown silt loam, by the effective nematocide dichloropropylene-dichloropropane, *Pythium aphanidermatum* withstanding dosages up to 550 lb. per acre and the other organisms surviving rates as high as 1,000 lb. Two other materials of similar chemical composition, viz., monochlorobutenes and trichlorobutanes, were also devoid of fungicidal properties. On the other hand, good to excellent control of damping-off in spinach and peas was given by arasan and spergon, respectively, both at 2 per cent. by weight [*R.A.M.*, xxiii, pp. 510, 511].

HORSFALL (J. G.). **Fungicides and their action.**—239 pp., 2 figs., 17 diags., 5 graphs, Waltham, Mass., The Chronica Botanica Co.; London, William Dawson & Sons, Ltd., 1945. $5.

In this work (to which D. Fairchild contributes a foreword), the main purpose of the author is to discuss, in the light of the chemistry and physiology of toxic action and of the mechanics of application, how to procure the proper materials for destroying fungi and how to apply them in sufficient quantity when and where the fungus is vulnerable. In general, the illustrative examples are taken from the field of plant pathology, but wood and fabric preservation, human pathology, bacteriology, and entomology are also drawn on. The book does not attempt to deal with practical questions of treatment, such as spray schedules, but aims rather at developing the underlying theory on which practice is based and by which it may be improved.

The matters dealt with by the sixteen chapters into which the work is divided include historical introduction, general concepts, laboratory assay [*R.A.M.*, xxiv, p. 424], data assessment, principles of chemical protection, deposition, coverage of single and multiple surfaces, tenacity, artificial immunization and chemotherapy, action of copper, sulphur, organic nitrogen compounds and other organic compounds, antagonism and synergism [ibid., xxiv, p. 327], and phytotoxicity. The bibliography extends to 23 pages, and both a general index and an index to authors are provided.

KLINKENBERG (CAROLINE H.). **Abnormale kurkvorming.** [Abnormal cork formation.]—Thesis, Univ. Amsterdam, 117 pp., 1 pl., 4 figs., 1 diag., 1940. [Received November, 1945.]

An exhaustive study was made at the Willie Commelin Scholten Phytopathological Laboratory, Baarn, of three forms of abnormal suberization, viz., (1) cork spots on the foliage of herbaceous plants; (2) different types of brown spots in apple flesh, variously known as (*a*) drought spot, internal cork, corky core, and corky pit and (*b*) bitter pit; and (3) corky roots of tomatoes.

On the leaves and stems of the herbaceous plants examined, which comprised a large number of Crassulaceae, Cactaceae, and succulents and non-succulents of other families, cork spots invariably developed round a necrosis, the form and extent of which determined the depth of penetration of the suberized areas. In some cases the thin-walled parenchyma cells alone are involved in the formation of the cork-layer, in others the thick-walled cells are also implicated.

The condition described by Banga [*R.A.M.*, xviii, p. 398] as 'storage pit' was observed in apples of the Brabant and Westland Bellefleur, Goudreinette, Kesterens Wijnzuur, Lemoen, Zoete Paradijs, and Reinette du Chené varieties, while 'tree pit' was present in Allington Pippin, Oranjereinette, and Early Victoria. In no case were any of the symptoms associated with boron deficiency detected, nor did cork enter into the composition of the necrotic storage or 'tree pit' spots. The healthy tissue on the fringe of the necrotic areas may react by the formation of callus strands and, very rarely, of a phellogen producing a few layers of small suberized cells.

Severe damage may be caused in Holland by a corky condition of tomato roots, which was also reported from the Lea Valley in 1928 and investigated by P. H. Williams at the Cheshunt Agricultural Experiment Station, where it was designated 'corky scab' [ibid., ix, p. 69]. The diseased roots contain necroses both in the outermost and underlying layers of the cortex, pericycle, and xylem, and round these necroses are formed rows of strongly suberized cells, in consequence of which the root undergoes characteristic disorganization. The pathological anatomy of 'corky scab' in tomatoes presents certain analogies with that of plants attacked by viruses, notably lupins suffering from 'sore shin' [pea mosaic virus: ibid., xxiii, p. 301]. It is considered probable, though not yet demonstrated, that 'corky scab' is caused by a virus, and a close parallel is further suggested between the tomato root disease and brown rot of tobacco [ibid., xviii, p. 634; xxiv, p. 405].

'Corky scab' may be induced in tomatoes by growing them in soil infested either by the previous cultivation of affected plants or by the admixture of diseased roots.

White (A. G. C.), Krampitz (L. O.), & Werkman (C. H.). **On a synthetic medium for the production of penicillin.**—*Arch. Biochem., N.Y.*, viii, 2, pp. 303–309, 1945.

In experiments on penicillin production at the Industrial Science Research Institute, Iowa State College, *Penicillium notatum* on a chemically defined medium yielded 80 to 90 per cent. of the titre obtained on the usual maize steep liquor medium. Maize steep liquor was fractionated and some properties of the stimulatory material determined. It is soluble in 60 per cent. alcohol, not hydrolysable in 30 per cent. sulphuric acid or 30 per cent. sodium hydroxide, largely precipitable by picric acid, and not extractable by butyl alcohol after 180 hours. Three amino-acids, arginine, histidine, and glutamic acid, in concentrations of 30, 30, and 400 mg. per 100 ml., respectively, appear to provide a large percentage of the stimulatory activity inherent in maize steep liquor.

Pratt (R.). **Influence of the proportions of KH_2PO_4, $MgSO_4$, and $NaNO_3$ in the nutrient solution on the production of penicillin in surface cultures.**—*Amer. J. Bot.*, xxxii, 8, pp. 528–535, 6 diags., 2 graphs, 1945.

A study of the accumulation of penicillin in cultures of *Penicillium notatum* [see preceding abstract] in 65 different nutrient solutions demonstrated that for a given level of phosphate ions, as the concentrations of magnesium and sulphate ions were raised, it was necessary to reduce the concentration of nitrate ion. From the standpoint of penicillin production, the best solutions contained not less than 8 millimoles of potassium dihydrogen phosphate and not more than 20 of sodium nitrate per l. The absolute concentrations in the optimum solution in this series were potassium dihydrogen phosphate, 0·019 M: magnesium sulphate 0·002 M; and sodium nitrate 0·019 M, the proportions of the three salts being 0·475, 0·05, and 0·475, respectively. In a series of solutions with these relative concentrations for the three salts, maximum potency on the seventh day resulted at a total salt concentration of 0·12 M.

Pratt (R.) & Dufrénoy (J.). **Physiological comparison of two strains of Penicillium.**—*Science*, N.S., cii, 2652, pp. 428–429, 1 fig., 1945.

A study of two commercially important strains of *Penicillium* [*R.A.M.*, xxv, p. 6] showed that one, *P.* sp. NRRL 1984-A yielded 40 to 50 units penicillin per ml. on a purely synthetic medium when growth factors were present as indole-acetic acid and/or naphthylene-acetic acid, adjuvants considerably enhancing penicillin production in such a synthetic medium, while the other, *P. chrysogenum* X1612, appeared to effect total synthesis of the penicillin molecule in reasonable amounts on a much less complex medium, though the provision of a suitable phenyl linkage was beneficial. With X1612 the addition of phenylacetic acid, 3·3 gm. per l., to the basal synthetic medium gave maximum yields of 225 units per ml.

In other tests the addition of sulphite waste liquor caused a decrease in penicillin yield with X1612 of 12 to 50 per cent., whereas the addition of sulphite waste improved yields with 1984-A in 19 out of the 36 cases by from 8 to 73 (mean 37) per cent.

Foster (J. W.), McDaniel (L. E.), Woodruff (H. B.), & Stokes (J. L.). **Microbiological aspects of penicillin. V. Conidiophore formation in submerged cultures of Penicillium notatum.**—*J. Bact.*, l, 3, pp. 365–368, 3 figs., 1945.

Abundant formation of conidia (roughly 400,000,000 per ml.) by about 14 strains of *Penicillium notatum* and one of *P. chrysogenum* [see preceding abstract] was obtained in four to six days at 20° to 30° C. in the following medium when aeration and agitation were effected by rotary shaking [*R.A.M.*, xxv, p. 6]: 20 gm. sucrose or brown sugar (grade soft No. 13), 6 gm. sodium nitrate, 1·5 gm. potassium phosphate, 0·5 gm. crystallized magnesium sulphate, and 25 gm. calcium chloride. The pigment secreted by the conidia imparted a greenish cast to the cultures.

Waksman (S. A.) & Reilly (H. Christine). **Agar-streak method for assaying antibiotic substances.**—*Industr. Engng Chem., Analyt. Ed.*, xvii, 9, pp. 556–558, 1945.

Details are given of the agar-streak method for the assay of antibiotic substances, which is considered to offer sufficiently marked advantages over other procedures to justify its wider use, especially in screening tests with a large number of organisms and in the isolation of antibacterial agents from the crude medium. The antibiotic activities of actinomycin, chaetomin, clavacin, fumigacin, gliotoxin, streptomycin, and streptothricin are tabulated. In a study of the inactivation of antibiotic substances by cysteine the test organism was found to exert a decisive influence.

Wooster (Ruth C.) & Cheldelin (V. H.). **Growth requirements of Penicillium digitatum.**—*Arch. Biochem., N.Y.*, viii, 2, pp. 311–319, 1 graph, 1945.

At $P_H 3$ (the approximate optimum for *Penicillium digitatum*), the maximum growth of an isolate of the mould from lemon fruit [*R.A.M.*, xx, p. 399] was obtained at the Oregon State College on a synthetic medium of which the only ingredient of unknown composition was vitamin-free hydrolysed casein. The carbohydrate requirements of the organism are adequately met by sucrose, glucose, fructose, or galactose, while the best nitrogen sources are asparagin and hydrolysed casein, especially in combination, peptone, aspartic acid, or ammonium salts supporting moderate growth. Of the various organic acids tested, only citric and malic permitted of appreciable development. *P. digitatum* requires the thiazole moiety of thiamin, quantitative growth curves for which may be obtained over the range of 0·01 to 3 γ per 25 ml. Pyridoxin, pantothenate, and biotin exert a stimulatory action, which in the case of the last-named is much more marked at and above P_H 6·5 (the second optimum for the mould) than at 3; in the presence

of 0·01 γ per 25 ml. the upper growth limit is extended by about one P_H unit. Growth within the same P_H range is further greatly activated by an unidentified factor in orange rind, which is soluble in water, methanol, 50 per cent. ethanol, and 50 per cent. acetone; insoluble in 95 per cent. ethanol, acetone, dioxane, ether, and pyridin; resistant to 11 hours' drying at 105° C., three hours' autoclaving at P_H 1 and 5, and to bromination, but destroyed by ashing, autoclaving at P_H 11, hydrogen peroxide in acid or alkali, and by nitrous acid; and removable by dialysis.

Borghetty (H. C.). **Mildewproofing of cellulose fibers.**—*Rayon Text. Mon.*, xxvi, 9, pp. 479–481, 1945.

A full account is given of the investigations and experiments carried out to satisfy the requirements of the United States Quartermaster Depot for suitable methods and products for the protection of fibres and fabrics from rot and mildew, on the basis of which the following were found to be appropriate for various purposes and under particular conditions: copapel A (cuprammonium carbonate) for permanency where 'feel' and colour are not important; puratized LN (2, 2-dihydroxy-5, 5-dichlorodiphenylmethane) [*R.A.M.*, xxiii, p. 71] and preventol GD (9-phenylmercuro-10-acetoxyoctadecanoic acid), semi-permanent types of mildew-repellents answering the majority of present Government specifications where 'feel' of fabric, colour, and toxicity requirements are important; puratized N 5-D (phenyl mercury oleate) [ibid., xxiv, p. 139], a semi-permanent product recommended for ease of application, especially with water-repellents; and puratized PC No. 1 (phenyl mercury acetate), semi-permanent, for use with alkali-soluble finishes, such as celfon.

Fargher (R. G.). **The incidence and control of mould and bacterial attack on textiles.**—*J. Soc. Dyers*, lxi, 5, pp. 118–122, 1945.

In this paper, read before the Midlands section of the Society of Dyers and Colorists at Nottingham University on 15th November, 1944, valuable information is presented on recent developments in the mildew- and rot-proofing of textiles [*R.A.M.*, xxiv, p. 427]. Cotton materials intended for use under humid conditions should be scoured with alkalis to remove various substances present in the raw cotton which contribute to the growth of micro-organisms. The following are the percentages of the inhibiting concentrations (preventing the growth in culture media for three weeks of the most common or resistant of 160 moulds isolated from mildewed cottons) of some newly discovered antiseptics in comparison with salicylanilide (shirlan) (0·01 to 0·02), para-nitrophenol (0·02), and zinc chloride (0·8), of which the two former are now extensively employed in England, while the last-named was in general use on fabrics designed for tropical climates before 1926; acetanilide 0·3, ortho-phenylphenol 0·02 to 0·03, trichlorophenol 0·005 to 0·01, pentachlorophenol 0·01 to 0·04, 2 : 3-dichloro- 1 : 4-naphthaquinone 0·04, 2 : 2′-dihydroxy- 5 : 5′-dichlorodiphenylmethane 0·08, mercaptobenzthiazole 0·02, zinc dimethyldithiocarbamate 0·16, para-acetoxymercuriacetanilide 0·005, and phenylmercuric acetate 0·02 to 0·04. Of these, mercaptobenzthiazole has shown considerable promise, especially in conjunction with salicylanilide. The joint use of two or more antiseptics, such as the foregoing or salicylanilide and para-nitrophenol, has been largely adopted of late to counteract the various drawbacks frequently arising from the application of one alone. The phenolic compounds are unduly volatile, while the mercurials lack stability in the presence of copper, iron, and zinc.

There are only two practicable methods of rot- (as distinct from mildew-) proofing, namely, copper and chromium treatments, a definite choice between which can only be made on the basis of experience of user-trials in the tropics. At the moment opinions differ widely as to the relative merits of the two processes. Roughly

speaking, the mineral khaki iron and chromium treatment is more effective against chemical attack by sun, air, and moisture, and copper compounds against microbiological infection. In either case, however, the efficacy of the method depends on the preliminary scouring of the material to reduce the incidence of mildew. Experiments have shown that copper may be lost through weathering more rapidly than has hitherto been supposed. Thus, after three months' exposure (5·38 in. rainfall), the percentages of copper hydroxide, copper carbonate, copper oleate, copper ricinoleate, copper naphthenate, cuprammonium, and chromium hydroxide in (*a*) 22-oz. cotton canvas, and (*b*) 9-oz. sheeting were 21, 14, 42, 71, 75, 14, and 94, and 3, 4, 30, 55, 38, 4, and 92, respectively. The persistence of copper is not appreciably improved by the application of waterproofing emulsions, but coating the fabric with wax, as in the cuprammonium-bitumen process, has shown some promise in this respect. The very much poorer persistence of copper as compared with chromium is associated with the readier solubility of the former in dilute solutions of weak organic acids. The high resistance to microbiological growth, in the absence of impurities, of chrome-proofed cotton resembles that observed with cellulose acetate, and may be due in part to a related cause, viz., a strong affinity between cellulose and hydrous chromic oxide. Some increase in the resistance of copper to leaching has been obtained by its application to previously mineral khaki-dyed or chrome-proofed materials; the comparable effect resulting from the use of the naphthenate is open to objections on the grounds of odour and greasiness.

The use of copper or chromium is contra-indicated in the case of fabrics to which drying oils may be applied, while the former may be detrimental to cotton or flax intended for rubber-proofing and to yarns or fabrics dyed dark green with sulphur.

Golding (N. S.). **The gas requirements of molds. IV. A preliminary interpretation of the growth rates of four common mold cultures on the basis of absorbed gases.**—*J. Dairy Sci.*, xxviii, 10, pp. 737–750, 12 graphs, 1945.

The growth of four common moulds of dairy products, *Aspergillus niger*, *Penicillium expansum*, *Aspergillus flavus*, and *Oospora lactis* [*R.A.M.*, xxiv, p. 426], on malt agar in various gas mixtures at different temperatures and pressures was shown to be influenced by the gas laws as they govern the solubility of the gases in the medium or mycelium. The inhibitory effect of carbon dioxide on the development of the moulds is in proportion to its solubility and not to the composition of the gas above the medium or mycelium.

Harris (G. C. M.). **Food yeast. The mycologist's contribution to post-war nutrition.**—*Int. Indust.*, N.S., xxv, 12, pp. 416–420, 1 fig., 1944.

A brief survey of the nutritional properties of food yeast is followed by an account of the industrial development by Colonial Food Yeast Ltd. in Jamaica for post-war needs of *Torulopsis utilis* var. *major*, an abundant and palatable source of protein and vitamin B [*R.A.M.*, xxiii, p. 399].

Sartory (A.), Sartory (R.), & Wurtz (B.). **(1) Contribution a l'étude de l'action du radium sur les champignons inférieurs. Les effets des radiations γ sur Sterigmatocystis nigra. (2) Influence des émanations du radium sur le Sterigmatocystis nigra.** [(1) Contribution to the study of the action of radium on the lower fungi. The effects of γ radiations on *Sterigmatocystis nigra*. (2) The influence of radium emanations on *Sterigmatocystis nigra*.]—*C.R. Acad. Sci., Paris*, ccxviii, 6, pp. 247–249; 8, pp. 328–329, 1944.

After 48 hours' exposure to 7·2 millicuries of radium, a culture of *Sterigmatocystis nigra* [*Aspergillus niger*] on a medium consisting of Czapek's solution 10 c.c., ammonium sulphate 0·5 gm., and distilled water to make up to 100 c.c. was

observed to comprise hyphae up to six times the normal dimensions, frequently terminating in ampullae discharging trails of protoplasm, abortive phialides and sterigmata, and various types of resting organs. Under a dosage of 14·4 mc., the protoplasm breaks up into well-defined, circular elements, 2 to 4 μ in diameter, simulating endospores, while in the hard parts of the mycelium, dark-coloured, bushy masses develop, consisting of interwoven, intricate hyphae and presenting the aspect of perithecia. A dosage of 21·6 mc. induces the formation, besides the foregoing growth types, of numerous highly-coloured, cylindrical, spinous bodies, extruding circular cells with a well-defined membrane and granular protoplasm, often in groups of four, sometimes five or six, occasionally singly, presumably representing asci and ascospores.

In the second paper further details are given of the development of perithecia, asci, and ascospores by *A. niger* under the influence of indirect irradiation.

Fries (N.). **Über Röntgen-induzierte physiologische Mutationen bei Ophiostoma multiannulatum (Hedgc. et Davids.). Vorlaüfige Mitteilung.** [On Röntgen-induced physiological mutations in *Ophiostoma multiannulatum* (Hedgc. & Davids.).]—*Ark. Bot.*, xxxii, 2, No. 8, 9 pp. 1945.

The physiological properties of six monospore mycelial mutants isolated from a nutrient agar culture of *Ophiostoma multiannulatum* [*Ceratostomella multiannulata*: *R.A.M.*, xix, p. 315] by 100 minutes X-ray irradiation were investigated. No. 225 was heterotrophic for biotin, 358 and 446 were both parathiotrophic, the former also reducing sulphite, which the latter was unable to do; in the case of 460 the essential growth factor was not identified; 513 appeared to require adenin; and 617 was heterotrophic for para-aminobenzoic acid. All the constitutional changes in the mutants were shown to be hereditary except for the capacity of No. 358 for the reduction of quadrivalent sulphur, which did not descend to the next generation.

Payette (A.). **Hétérotrophie envers la thiamine de quelques champignons phytopathogènes.** [Heterotrophy in respect of thiamin of some phytopathogenic fungi.]—*Ann. Ass. canad.-franç. Sci.*, xi, p. 90, 1945.

In a mineral-dextrose medium containing some organic acids, glycine, and asparagin, *Phytophthora infestans* required a supplementary dose of vitamin B for its development; *Septoria avenae* and *S. pisi* could dispense with one or the other constituent of thiamin (pyrimidin or thiazole); *Stereum purpureum* derived noticeable benefit from the addition to the substratum of pyrimidin or thiazole and still more from a mixture of the two components or of the complete molecule; and *Schizophyllum radiatum* was capable of slight growth in the presence of either pyrimidin or thiazole, but developed much more freely with added thiamin and best of all with a mixture of the two components.

Neuweiler (E.). **Kartoffelanbauversuche der Vereinigung schweizerischer Versuchs- und Vermittlungsstellen für Saatkartoffeln, durchgeführt von schweizerischen landwirtschaftlichen Schulen, von Mitgliedern der Vereinigung, von Saatgutgenossenschaften und landwirtschaftlichen Betrieben.** [Potato-cultivation experiments of the Union of Swiss Experiment Stations and Agencies for Seed Potatoes, carried out by Swiss agricultural schools and members of the Union, of co-operative societies for seed production, and of agricultural concerns.]—*Annu. agric. Suisse*, xlv, 9, pp. 865–889, 1944. [French summary.]

The following items of phytopathological interest occur in this report of potato-cultivation experiments in Switzerland from 1938 to 1943. In the main series of trials (1938 to 1940) on table potatoes, the percentages of severe virus infection (average for 17 varieties) in 1938, 1939, and 1940 were 7·9, 29, and 51, respectively. The most resistant was the medium-early Flora, which showed only 9 per cent.

severe infection in 1940, followed by Edelgard (late) with 17 per cent., while the minimum for the rest of the varieties was 30 per cent., the late Industrie, Gloria, Kapro, and Prisca, for instance, being attacked to the extent of 71, 90, 94, and 76 per cent., respectively. Brief descriptions are given of each of the test varieties, with notes on their reactions to virus diseases and late blight [*Phytophthora infestans*: cf. *R.A.M.*, xxv, p.]. Besides those already mentioned the early Frühmölle and the medium-early Frühbote and Sieglinde are fairly resistant to virus infection but very susceptible to late blight. Apulia (medium-early) is slightly to moderately susceptible to degeneration (of virus origin) and *P. infestans*, Record semi-resistant to both diseases, Centa (late) susceptible to virus infections and fairly so to late blight, and Katahdin resistant to mild mosaic [potato virus X] but rather susceptible to the severe form [potato virus Y] and *P. infestans*. All the varieties except Industrie are immune from wart disease [*Synchytrium endobioticum*].

Virus diseases were also largely responsible for the deterioration of the six fodder varieties under observation during the period under review, and in fact necessitated the discontinuance of three, viz., Spätrot, Schlesien, and Robinia. The average percentage of infection in 1940 for the three remaining varieties, Sickingen, Rubingold, and Herulia, was 20, the first-named showing the largest increase compared with 1938 (from 3·3 to 31 per cent.). Rubingold and Sickingen are susceptible to late blight, the other fodder varieties less so. Prisca, which may be grown either for the table or as fodder, is fairly susceptible to virus diseases and resistant to *P. infestans*.

In a series of trials (1940 to 1942) on 14 imported culinary varieties the average severe virus infection rose from 3·5 per cent. in the first year to over 64 in the third. The medium-early Flava, already tested in the foregoing series but included here as a standard, gave the best performance, with 10 per cent. severe infection in the third year compared, for instance, with 100, 95, 88, and 82 per cent. in The Alness (British early), Taara (Estonian medium-late), Kratt (Estonian late), and Draga (German early), respectively; only three varieties besides Flava showed under 50 per cent. disease, i.e., Oberarnbacher Frühe (German medium-early), Celerina III (German medium-late), and Arran Banner (British medium-early) with 39, 45, and 47 per cent., respectively.

Supplementary experiments were carried out in mountainous districts in 1939–40 (Elm, canton of Glarus) and 1941–43 (Lower Engadine). Under these favourable conditions for the crop the average incidence of severe virus infections in the five varieties comprised in the former test increased only from 1·1 to 2·5 per cent., Voran (late) being the most resistant with 0·5 per cent.; in the latter test the average for ten varieties in 1943 was 3·8 per cent. as against 1·8 in 1941.

Larson (S. G.). **Bladlusene og deres Betydning som Virusspredere paa Beder og Kartofler.** [Aphids and their importance as virus disseminators on Beets and Potatoes.]—*Tidsskr. Planteavl*, xlv, 1, pp. 97–139, 1940. [Received January, 1946.]

Following a summary of the available information concerning the life-history and biology of aphids and the nature of viruses, the writer gives an account of the functions of the former as vectors of certain beet and potato viruses in Denmark. The sugar beet mosaic virus [*R.A.M.*, xxii, p. 124] is spread mainly by *Aphis fabae*, the other aphid pest of beets, *Myzus persicae*, though technically capable of transmitting the inoculum, being of little or no practical importance in the spread of the disease. It may be safely accepted that the infective material assimilated by one generation of aphids is not transmissible to the next, and that consequently all individuals overwintering in the egg stage on various shrubs, such as *Euonymus europaeus* and *Viburnum opulus*, are virus-free. The same will also naturally apply to the spring migrants since the winter hosts do not harbour the virus. Further-

more, the disease not being transmissible through the seed or soil, young beets are presumably also healthy until they are infected by winged aphids after feeding on the seed-bearer beets, but once the disease is acquired by the young plants they develop mosaic symptoms and harbour the virus until the following year. It is possible that the aphids may also overwinter on diseased beets in clamps, which would provide another source of spring inoculum. Mechanical transmission of the virus is of negligible importance, and even aphid activities in this direction are largely confined to seed-producing areas; arising from these observations, an obvious control measure consists in the separation of the new crop from the seed-bearers and laying out the fields in such a way that the prevailing wind does not pass from the old to the young plants.

In the case of beet yellows virus [ibid., xxiv, p. 485] the roles of the two aphids under discussion are reversed, *M. persicae* alone being concerned to any appreciable extent in its transmission. Unlike the sugar beet mosaic virus, that of sugar beet yellows is distributed at random over the field, the viruliferous wingless nomads produced by the spring migrants on any one part passing rapidly from leaf to leaf of the beets in the immediate vicinity. Very few winged individuals develop during the summer, so that new foci of infection are unlikely to be found later than July. In contrast to *A. fabae*, the stationary colonies of which are clearly visible and amenable to control by nicotine sprays, the visits of *M. persicae* are of brief duration, and moreover, the aphids are so well concealed on the under side of the leaves as to escape the farmer's observation. The sugar beet yellows virus overwinters principally on cultivated beets in clamps, and hence the control of the disease should be based on the selection of sound plants for next year's seed; their storage in separate clamps, which should be cleansed in the spring, primarily of germinating beets but also, where infection has been severe, of orache [*Atriplex*] and goosefoot [*Chenopodium*]; and precautions against contamination by overwintered spinach or diseased greenhouse plants of the Chenopodiaceae [ibid., xvii, p. 338].

Of the many viruses attacking potatoes the potato leaf roll virus is one of the most serious [ibid., xxiv, p. 402]. It overwinters exclusively in infected tubers, and the spring migrants of the aphid vector, *M. persicae*, are virus-free, unless they happen to have hibernated on diseased tubers in the cellar or clamp. Thus, in fields consisting entirely of healthy plants, the sucking of the aphids will cause no injury, but where a few infected individuals are present heavy losses may be expected in the course of the summer, not only from the visits of the spring migrants themselves, but also, at a later date, from those of the succeeding generation of wingless nomads; the full extent of such secondary attacks can only be gauged in the following season, since the symptoms they induce on the host at this late stage are indeterminate. The importance of the use of healthy seed stocks will be apparent from the foregoing observations. They are procurable in Denmark from so-called 'sanatorium districts' the exact limits of which have not yet been defined, where few or no aphids are present. By this means leaf roll can be virtually eliminated from a given potato variety within a few years without risk of an early recurrence.

Van der Plank (J. E.). **Suitability of a cool maritime climate for seed Potato production.**—*Nature, Lond.*, cliv, 3916, pp. 644–645, 1944.

The author describes simple equipment, comprising only a maximum and minimum thermometer and a Stevenson screen, for use in a test to decide the most suitable localities for seed-potato production in a cool, maritime climate in South Africa. The criteria adopted were a mean maximum temperature about 65° F. or less, and a daily range of 13° or less, during June. While averages over many years are ultimately concerned, substantial accuracy may be possible in a single season by determining from existing records the necessary correction for seasonal

abnormality. Such records indicate land worth surveying. In the case of South Africa a really suitable maritime climate for this purpose was found in the course of the survey to be limited to a narrow, barren strip along the west coast. In such climates it is considered that aphid surveys should be continued over many years if they are to be sound, and that a June temperature test has advantages not only in respect of speed, but because it is unaffected by the often remediable proximity of *Brassicae* or other winter hosts, and because, being a test of the climatic conditions governing the flight of *Myzus persicae*, it measures the tendency towards migration, a finer test of fitness than the total number of aphids present. In the maritime type of seed area cool, moist sea winds are desirable and their prevalence can be recognized simply by the intensity of the maritime influence on climate, as determined by the June temperature test. Mere bleakness and high altitude are no adequate substitutes for exposure to the sea. In a hot, dry climate [*R.A.M.*, xxiii, p. 312] a mean maximum during the summer of about 90°, a daily range of 28° to 35° or more, and strong, hot, dry land winds are the desirable features for the production of good seed.

Hellbo (E.). **Den förenklade fältkontrollen med Utsädespotatis under år 1944.** [The simplified field inspection of seed Potatoes during the year 1944.]—*Landtmannen, Uppsala*, xxix, 2, pp. 31–32, 1945.

Of 813 potato fields inspected for certification in Sweden during 1944 (42 per cent. more than in 1943), 625 (76·9 per cent.) were passed, while 8·5, 11·7, and 2·9 per cent. of the failures were rejected on account, respectively, of varietal impurities, severe disease, and a combination of the two latter factors. The province of Halland submitted an area of 127·7 ha. for inspection, of which 52·3 ha. (41 per cent.) was rejected, an indication of the widespread distribution of virus diseases in this region [*R.A.M.*, xxv, p. 77]. Of the total number of fields examined, 36 (4·4 per cent.) contained more than 10 per cent., and 62 (7·6) between 5 and 10 per cent. virus disease, the maximum permitted incidence being 5 per cent.

Björling (K.). **Fältförsök med Potatiskräfta år 1944**. [Field experiments with Potato wart in the year 1944.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1944*, 6, pp. 81–84, 1 fig., 2 diags., 1944.

Of 15 new potato selections tested for their reaction to wart disease [*Synchytrium endobioticum*] in 1944 in an infested field in Scania, Sweden [*R.A.M.*, xxv, p. 78], 14 had proved immune in preliminary laboratory tests and one slightly susceptible. In the field trials 13 of the 14 remained immune, one was as heavily infected as the susceptible Prof. Wohltmann, used as a control, while the slightly susceptible selection continued to react in the same way. It is evident from these results that laboratory tests afford a reasonably reliable indication of varietal response to wart disease, but that they require to be confirmed by further experiments in the field before release for the market as definitely immune can be sanctioned.

Holmberg (C.). **Hur länge kan Potatiskräftans smittämne kvarleva i jorden?** [How long can the inoculum of Potato wart persist in the soil?]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1944*, 6, pp. 84–86, 1944.

In the autumn of 1928 renewed outbreaks of potato wart [*Synchytrium endobioticum*] after a period of quiescence were reported from a number of districts in south and central Sweden [*R.A.M.*, viii, p. 123 and preceding abstract], and in 1944 experiments were conducted on 16 sites, 13 infected in 1928 and 3 in 1929, to determine the duration of persistence of the pathogen in the soil. In some of the test areas wart-immune potatoes had formed part of the rotation since the

recurrence of the epidemic, while others had been allowed to revert to grass. The fungus was found to have disappeared completely from the cultivated soils, whereas in those used for pasturage, hay, and the like, it was still actively pathogenic to the susceptible Up-to-Date.

HOLMBERG (C.). **Potatiskräfta och Potatisål i Sverige år 1944.** [Potato wart and Potato eelworm in Sweden in the year 1944.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 1, pp. 12–13, 1945.

During 1944 potato wart [*Synchytrium endobioticum*] was reported from 76 allotments distributed over 29 parishes in 12 provinces of Sweden [see preceding abstracts], 15 of the new foci originating in eight localities hitherto free from infection.

JAARSVELD (ALIDA). **De invloed van verschillende bodenschimmels op de virulentie van Rhizoctonia solani Kühn.** [The influence of various soil fungi on the virulence of *Rhizoctonia solani* Kühn.]—Thesis, Univ. Amsterdam, 101 pp., 5 pl., 2 figs., 15 graphs, 1940. [Received November, 1945.]

This is the original version of the author's studies on the antagonism of various soil fungi to *Rhizoctonia* [*Corticium*] *solani*, as expressed in the reduction of its pathogenicity to Chinese cabbage seedlings, the salient features of which have already been noticed from another source [*R.A.M.*, xxii, p. 494].

VANDERWALLE (R.) & ROLAND (G.). **Contribution à l'étude du mildiou de la Pomme de terre.** [A contribution to the study of Potato 'mildew'.]—*Parasitica*, i, 2, pp. 41–57, 1 pl., 1945. [Flemish summary.]

In a study of potato 'mildew' [blight: *Phytophthora infestans*] carried out at Gembloux, Belgium, in 1942, the main points investigated were varietal susceptibility, the influence of cultural factors on severity of attack, and the relation between the microclimate of the host and the disease.

Experimental infections showed that the foliage of the extensively cultivated Bintje variety is much more susceptible to *P. infestans* than that of Robusta and Erika, though these became severely infected under certain circumstances. Foliage grafts between varieties of different degrees of susceptibility did not affect their susceptibility. When cut halves of tubers were inoculated under moist conditions with *P. infestans*, the Robusta variety was the least susceptible to rot (associated also with *Fusarium* sp., *Penicillium glaucum*, and bacteria), Erika intermediate, while Bintje was most susceptible. Field observations on 12 varieties showed that Prisca was the least susceptible to foliage infection by *P. infestans* and Belle de Fontenay and Alberta to tuber rot.

Fertilizer treatment, planting space, and seed-tuber weight appeared to have no effect on intensity of foliage attack. When Bintje tubers were planted on 9th April, 11th May, and 19th June, *P. infestans* appeared at the end of July in the plots planted on the two earlier dates; on 4th August infection was very severe on these plants, while the plot planted on 19th June was only lightly attacked. By 26th August, however, the foliage in all three plots was completely destroyed.

Evidence was obtained that the temperature of potato plants was slightly lowered both by nitrogenous manuring and closer spacing.

DE BRUYN (HELENA L. G.). **Methode voor het vaststellen van de vatbaarheidsgraad van Aardappelknollen voor de Aardappelziekte.** [Method for the determination of the degree of susceptibility of Potato tubers to late blight.]—*Tijdschr. PlZiekt.*, xlix, 5–6, pp. 77–99, 1943. [English summary. Received November, 1945.]

The following method was devised at the Mycological Laboratory, Wageningen,

Holland, for the determination of susceptibility to late blight (*Phytophthora infestans*) in potato tubers [*R.A.M.*, iv, p. 761; vi, p. 47; xi, p. 71; xix, p. 490, *et passim*]. Tubers wounded with a cork borer are inoculated with a zoospore suspension, cut in two after five days, the cylindrical piece enclosed by the wound being removed, and the two halves placed in a humid atmosphere in the dark. Observations are made every three days for a fortnight, at which juncture tubers showing necrosis but no mycelium are considered to be diseased. The temperature of 10° C. at which the tubers are kept, being unfavourable to the development of *P. infestans*, accentuates intervarietal differences.

The experiments under discussion covered the winters of 1940–1 and 1941–2 and involved 22 varieties; the inoculations were performed with two isolates of the fungus, half through the navel and half through the seed end. Three types of resultant necrosis were differentiated, namely, I, in which the initial symptom is a sharply defined necrosis, followed by mycelial production: this was the most prevalent form of infection, occurring in Alpha, Eersteling [Duke of York], Eigenheimer, Evergood, Frühmölle, Hellena, Katahdin, Thorbecke, Triumph, Voran, Westeinder Blauwe, and Zeeuwsche Blaue; II, an ill-defined necrosis develops simultaneously with the mycelium, as in Bevelander, Bintje, and Bravo; and III, characterized by the production of the mycelium and fructifications before the necrosis, observed in Furore, Industrie, Matador, Noordeling, Populair, Record, and Roode Star. In general, the navel end proved to be the more susceptible of the two extremities, the varieties in which the differences were least noticeable falling in type III.

The disparities in virulence between the two isolates suggest that they belong to different physiologic races of *P. infestans* [ibid., xvii, p. 765; xxiii, p. 147, *et passim*], but in the absence of a test assortment of varieties this point could not be definitely decided. The average percentages of successful inoculations secured with isolates I and II over the two-year period on roughly 2,000 tubers of Eigenheimer, 1,000 of Alpha (the two controls), and 400 of each of the other 20 were 90 and 82, respectively. The least susceptible varieties were Hellena (with 55 per cent. diseased tubers), Bravo (68 per cent.), Matador (76 per cent.), and Voran (77 per cent.).

Several workers on late blight have reported modifications in pathogenicity caused by the influence of the last host [ibid., xiv, p. 391; xvi, p. 53; xvii, p. 482], and similar observations were made in the course of the studies herein described. In 1942–3 an experiment was instituted to obtain further information on this question. The fungus was cultured on four varieties, Alpha, Duke of York, Eigenheimer, and Bravo, and cross-inoculations carried out on 20 tubers of each. The numbers of the four mean periods required for the development of mycelium from the zoospores of sporangia grown on each of the four varieties were added together, and the ratio computed between the times necessary for the production of infection by the zoospores of a given variety and those of Alpha. A third monospore isolate of the fungus, Z, was included in the test, which comprised 12 varieties. There were considerable differences between the varieties in the ratio of the period elapsing from inoculation to mycelial production, ranging for isolate I from 0·73 (Industrie) to 1·08 (Eigenheimer), for II from 0·83 (Bintje) to 1·25 (Evergood), and for Z from 0·56 (Record) to 1·09 (Voran). No correlation was established between the degree of susceptibility of a given variety and the pathogenicity of the fungus, after growth thereon, to a new host.

The experimental data are considered to show that a method for the determination of the reaction of potato tubers to *P. infestans* is practicable, provided the following conditions are observed: (1) the use of zoospores for inoculation, (2) growth of material for inoculum on special varieties, and (3) maintenance of the infected tubers at 10° C.

Cunningham (H. S.) & Reinking (O. A.). **Fusarium seed-piece decay of Potatoes on Long Island.**—*Fm Res.*, xi, 3, pp. 8-9, 2 figs., 1945. [Abs. in *Exp. Sta. Rec.*, xciii, 5, p. 592, 1945.]

Preliminary tests indicated that potato seed-piece decay caused by *Fusarium* spp. [*R.A.M.*, xxiv, p. 267] is controllable by seed treatment. The fungus most frequently obtained from dry-rot tubers was *F. caeruleum* [ibid., xxiv, pp. 201, 245], but *F. solani* [var.] *striatum* [cf. ibid., xiv, p. 613] and *F. sambucinum* f. 6 [cf. ibid., xxiv, p. 384] were also isolated.

Seth (L. N.). **Studies on the false-smut disease of Paddy caused by Ustilaginoidea virens (Cke.) Tak.**—*Indian J. agric. Sci.*, xv, 1, pp. 53–55, 1945.

False smut of rice (*Ustilaginoidea virens*) [*R.A.M.*, viii, p. 716; xvi, p. 231], ordinarily of minor importance in Burma, appeared in epidemic form in 1935 at Hmawbi and the surrounding areas. In 1936 the disease reappeared in a milder form and from 1937 to 1941 caused no anxiety. At Hmawbi the Agricultural Farm was the chief centre of infection when some plots showed all the plants diseased and about 6 per cent. of the grains infested. In germination tests spores from fresh sclerotial bodies showed after 24 hours about 10 per cent. germination, each spore producing a short, unbranched germ-tube. After another 48 hours the germ-tubes were found profusely branched and septate, bearing clusters of small pear-shaped, hyaline conidia formed both terminally and laterally at the hyphal tips. Transfers of the branched germ-tubes and secondary conidia to a Quaker oats medium developed a white, fluffy, felt-like mycelium which after three weeks produced many white, compact, almost round sclerotial bodies. These turned orange-yellow and finally olive-green, becoming slightly powdery in appearance and corresponding closely with those on the host plant.

On plain agar the secondary conidia germinated similarly to the parent spore. They became slightly swollen at first, and then produced branched and septate germ-tubes bearing clusters of small, piriform, hyaline conidia at the tips. Compared with the parent spores these tertiary conidia were slightly smaller and their germ-tubes narrower and sparsely septate. On transference to Quaker oats agar, the usual sclerotial bodies were obtained from these germ-hyphae and tertiary conidia.

Sclerotia were obtained repeatedly in the laboratory in cultures made during November to February, but none formed in cultures made from March to August, when the growth of the mycelium also was not typical, being mainly flat and devoid of aerial hyphae. The fungus failed to grow at 34° C. and prolonged incubation at this temperature was lethal. The optimum temperature appears to be in the neighbourhood of 26°. Viability of the spores does not exceed eight months. Inoculation of flowers and of grains in the milk stage failed to produce infection and seed dusted with spores produced healthy plants.

Schneider (H.). **Surveys and observations on Verticillium wilt of Guayule in California from 1943 to 1945.**—*Plant Dis. Reptr*, xxix, 22, pp. 615–617, 1945. [Mimeographed.]

The final report of investigations from 1943 to 1945 into infestation with *Verticillium* wilt of fields planted with guayule [*Parthenium argentatum*: *R.A.M.*, xxiv, p. 284] by the United States Emergency Rubber Project in Kern County, California, shows that plants grown in infested fields, which escape infection during the first spring, are susceptible to it in the course of the following autumn, winter, or spring. Some of the severely affected plants may partly recover under the high summer temperatures of Kern County but remain much smaller than healthy plants. Most moderately infected plants, while showing external signs of recovery, remain stunted, and the rubber yield on a 40-acre field was reduced by about,

25 per cent. The rubber content was not lowered, but the dry weight was considerably reduced.

Shive (J. W.). **Boron in plant life—a brief historical survey.**—*Soil Sci.*, lx, 1, pp. 41–51, 1945.

The role of boron in plant economy is reviewed in the light of contemporary studies under the headings of discovery and distribution of boron in plants and soils, boron as a toxic and as a stimulating agent, indispensability of boron for plants, nature of boron-deficiency effects, and relation of boron to other elements in nutrition of plants. The bibliography comprises 46 titles.

McCalla (T. M.). **Microbiological studies of the effect of straw used as a mulch.**—*Trans. Kans. Acad. Sci.*, xlvi, pp. 52–56, 2 graphs, 1943. [Received November, 1945.]

Observations and tests at the Nebraska Agricultural Experiment Station indicate, *inter alia*, that during damp weather the top layer of soil mulched with plant residues has a much larger population of fungi and other micro-organisms than ploughed land without such material. Immediately after straw residues are ploughed under, there is a larger increase in the number of bacteria and fungi than in comparable soil mulched with straw. After six months, roughly one-third of two-ton applications of maize stalks had rotted, the corresponding figures for two-, four-, and eight-ton treatments with wheat straw being two-thirds, one-half, and one-third, respectively.

Eisenberg (W. V.). **An unusual distribution of a rust: an aecidium on Lippia berlandieri.**—*Plant Dis. Reptr*, xxix, 22, pp. 618–620, 1945. [Mimeographed.]

The aecidial stage of a rust found on the lower surface of leaves of oregano (*Lippia berlandieri*), an aromatic shrub used for seasoning food, from Mexico, was identified by the author as *Aecidium evansii* P. Henn., reported by T. B. R. Evans from the Transvaal in 1908 (*Englers bot. Jb.*, xli, pp. 270–273). The identification was confirmed by Dr. G. B. Cummins.

Keyworth (W. G.). **Hop diseases.**—*Rep. E. Malling Res. Sta., 1944*, pp. 31–32, 1945.

During 1944 three outbreaks of *Verticillium* wilt of hops (*V. albo-atrum*) [*R.A.M.*, xxiv, p. 165] were newly reported to East Malling. One was a progressive outbreak of at least three years' standing. In addition, eight previously known outbreaks were notified during the Ministry of Agriculture inspections for the certification of wilt-free gardens. Of these, four were in Kent, and four in the West Midland area; none appeared to be of the progressive type. In pathogenicity studies by I. Isaac, comparative soil infections of field plots with diseased bines from progressive and fluctuating outbreaks, respectively [cf. ibid., xviii, p. 709], yielded differences in wilt incidence, but parallel stem inoculations showed no difference in pathogenicity. When this soil-inoculation experiment was repeated on two contrasted soil types, the average wilt severity on one differed widely from that on the other. When a similar test was carried out in tubs, marked differences in incidence were observed as between the two soils.

All the isolates of *Phytophthora cactorum* [ibid., xxii, p. 406] obtained from hops in widely separated localities appeared to be morphologically identical; the fungus is, probably, a common soil inhabitant of hop gardens.

An abnormal form of hop canker, apparently due to a *Fusarium*, affected the bines at 6 to 18 in. above soil-level in numerous localities.

KEYWORTH (W. G.). **Three important Hop diseases.**—*Rep. E. Malling Res. Sta. 1944*, pp. 130–134, 3 figs., 1 map, 1945.

This paper on the hop diseases *Verticillium* wilt [*V. albo-atrum*], nettlehead, and mosaic is a reprint of one already noticed from another source [*R.A.M.*, xxiv, p. 287].

SHEPHARD (C. Y.). **The Sugar industry of Fiji.**—60 pp., 6 maps, London, H.M. Stationery Office, 1945. 1*s*.

Only three sugar-cane diseases are at present considered to be of potential importance in Fiji, according to a statement on p. 15 of this report. Fiji disease has been effectively combated by reducing the number of ratoons to one, planting a green-manure crop between periods of cane cultivation, regular inspections of young cane for the purpose of roguing, selection of sound planting material, and use of resistant varieties. Leaf scald (*Bacterium* [*Xanthomonas*] *albilineans*) and downy mildew (*Sclerospora sacchari*) have also been held in check by the measures adopted by the Colonial Sugar Refining Company.

DUNCKELMAN (P. H.) & EDGERTON (C. W.). **Report on cooperative tests with the hot water treatment of Sugarcane.**—*Sug. Bull., N.O.*, xxiii, 18, pp. 138–141, 1945. [Abs. in *Exp. Sta. Rec.*, xciii, 5, p. 593, 1945.]

In further work on the hot-water treatment of seed sugar-cane [? against *Physalospora tucumanensis*: cf. *R.A.M.*, xxiii, p. 359] the results obtained [which are tabulated] confirmed those of previous years, treatment at 52° C. for 20 minutes again giving increased yields.

BLUMER (S.). **Parasitische Pilze aus dem Alpengarten Schynige Platte.** [Parasitic fungi from the Alpine garden Schynige Platte.]—*Mitt. naturf. Ges. Bern*, N.F., i, pp. 39–53, 1 fig., 1944.

Since 1932 the writer has paid one or two annual visits to the Schynige Platte Alpine garden, which was laid out in 1929, and at the time of writing 67 indigenous parasitic fungi had been identified on 65 hosts, of special interest being *Entyloma ranunculi* on *Delphinium elatum* and *Ustilago violacea* on *Gypsophila repens*.

VIÉGAS (A. P.). **Alguns fungos do Brasil. IV. Uredinales.** [Some fungi of Brazil. IV. Uredinales.]—*Bragantia, S. Paulo*, v, 1, pp. 1–144, 48 pl., 89 figs., 1945.

Included in this critically annotated list, accompanied by numerous excellent illustrations, of Brazilian rusts [cf. *R.A.M.*, xxiv, p. 207] are *Coleosporium ipomoeae* on sweet potato [ibid., xxiii, p. 245] in São Paulo; *Phakopsora crotalariae* on *Crotalaria anagyroides* in São Paulo; *Puccinia menthae* on *Mentha arvensis* in São Paulo [ibid., xxiii, p. 189]; *P. psidii* [ibid., xxiv, p. 353] on guava in São Paulo and Parahyba, *Eugenia jambos* in São Paulo and Rio de Janeiro, *E. uvalha*, *Myrciaria jaboticaba*, and *Marlierea edulis* in São Paulo, and *Callistemon speciosus* in Minas Gerais; *P. purpurea* on sorghum in São Paulo and Sergipe and on *Sorghum halepense* in São Paulo and Parahyba; *Ravenelia indigoferae* on *Indigofera anil* [cf. ibid., xv, p. 703] in São Paulo; and *Uromyces manihotis* on cassava in Rio de Janeiro and São Paulo [ibid., xvii, p. 17].

THOM (C.) & RAPER (K. B.). **A manual of the Aspergilli.**—ix+373 pp., 7 col. pl., 76 figs., London, Bailliere, Tindall & Cox, 1945. £1. 18*s*. 6*d*.

This valuable book is designed as an aid to the identification of the members of the genus *Aspergillus*; as the authors point out, it is not a monograph, and is an entirely new work, not a new edition of the well-known 'The Aspergilli' of Thom and Church [*R.A.M.*, v, p. 700]. The first six chapters comprise a general discussion of the history, classification, morphology, laboratory treatment, and variation

of the genus. Of the following 15 chapters the first explains the use of the manual, with keys based on colour and morphology, and the others are each devoted to one of the main groups into which the genus is subdivided. The final four chapters provide topical and general bibliographies, a full check list of species, and a list of the species and varieties accepted by the authors. This last list comprises 77 species, eight varieties, and four mutants [the sub-specific rank 'mut.' is adopted, though this is not provided for by the International Rules of Nomenclature].

The descriptions given are based on the authors' observations of large numbers of isolations, including type cultures whenever this has been possible; a few species known only from type material and literature are, however, accepted. One new variety is recorded: *A. terreus* var. *aureus*, from soil, Texas [without a Latin diagnosis]; changes in nomenclature include *A. butyracea* n. comb. (syn. *Sterigmatocystis butyracea* Bain), *A. foetidus* nom. nov. [as n. sp.] (syn. *A. aureus* Nak.), *A. fonsecaeus* nom. nov. [as n. sp.] (syn. *S. fusca* Bain.), *A. mangini* nom. nov. [as n. comb.] (syn. *A. minor* (Mang.) Thom & Church), and *A. terreus* var. *boedijni* n. comb. (syn. *A. boedijni* Blochw.).

Of the numerous illustrations the most useful are the relatively few line drawings. The colouring shown in the photographs of plate cultures does not always conform fully with descriptions in the text.

Fisher (Eileen E.). **Notes on two Australian fungi of the 'sooty mould' group.**—*Proc. roy. Soc. Vict.*, N.S., liv, 1, pp. 1–4, 1 pl., 1942. [Received December, 1945.]

In this paper, read on 3rd April, 1941, notes are given on two Australian sooty moulds, *Limacinia phloiophilia* n. sp. and *Hysterostomella filicina*. The former was found on *Kunzea peduncularis* in Victoria and *Leptospermum lanigerum* var. *montanum* in Tasmania and the latter occurred as a parasite on *Dicksonia antarctica* near Melbourne.

Heggestad (H. E.). **Varietal variation and inheritance studies on natural water-soaking in Tobacco.**—*Phytopathology*, xxxv, 10, pp. 755–770, 3 figs., 1945.

The inheritance of the natural water-soaking character in tobacco was studied at the Wisconsin Agricultural Experiment Station in crosses involving seven varieties of varying reactions. The F_1 progeny were mostly intermediate in respect of the condition between the susceptible and resistant parents, but in crosses between Samsun (intermediate) and Daruma (very resistant) and Havana 211 (intermediate) and Havana 142 (resistant), no water-soaking developed in two trials on the offspring, suggesting partial dominance of the resistant character. The responses of the F_2 and F_3 families clearly indicated the segregation of many genetic factors controlling the inheritance of water-soaking. F_3 families approximating in resistance to the most resistant parent were obtained. In inoculation experiments with the wildfire organism (*Phytomonas tabaci*) [*Pseudomonas tabacum*] on 15 tobacco varieties under conditions favourable to natural water-soaking [*R.A.M.*, xvii, p. 205] resistance to the disease was closely correlated with resistance to water-soaking. Variations in reaction to natural water-soaking were also observed between different species of *Nicotiana* and between tomato, oats, and maize varieties. In the case of oats, a correlation was experimentally demonstrated between liability to water-soaking and susceptibility to halo blight (*Phytomonas* [*Pseudomonas*] *coronafaciens*).

Kikuta (K.), Hendrix (J. W.), & Frazier (W. A.). **Pearl Harbor a Tomato variety resistant to spotted wilt in Hawaii.**—*Circ. Hawaii agric. Exp. Sta.* 24, 6 pp., 3 figs., 1945.

The Pearl Harbor variety of tomato, stated to have particular value for those

areas in Hawaii where tomato spotted wilt is destructive, has been developed from a cross of the highly susceptible Bounty variety with the very resistant but unfruitful BC–10 [*R.A.M.*, xxiii, p. 7], an F_2 selection of 133–6×Red Currant×133–6 received from the California Agricultural Experiment Station. It is thought that Pearl Harbor, although resistant to spotted wilt in Hawaii (0·7 per cent. infected plants as against 47·7 per cent. for Bounty), may not show appreciable resistance to other strains of this virus, and like Bounty it has been observed to be susceptible to other serious diseases of tomato, such as *Stemphylium* leaf spot [*S. solani*], *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*], bacterial wilt, mosaic, and others. It is accordingly recommended for commercial planting only where spotted wilt is severe. When crossed with other varieties, the resistance of Pearl Harbor to spotted wilt is reproduced in plants of the F_1 generation. Consequently F_1 hybrid seed, with Pearl Harbor as one parent, can be used as a means of combating spotted wilt.

Forest Research in India and Burma, 1942–43. Part I. The Forest Research Institute.—144 pp., 1944. [Received December, 1945.]

The following items of interest occur on pp. 77–81 of this report [cf. *R.A.M.*, xxi, p. 399]. The fungi *Asterostomella rhodospora* and *Stereum fasciatum*, the causal agents of heart rot of bird cherry [*Prunus padus*], oak, and maple, have been grown in culture. *Trametes serialis* [ibid., xxii, p. 506] was isolated from Sitka spruce [*Picea sitchensis*] imported from Canada for aircraft construction, infection manifesting itself by brown spots, with decay of the woody tissues as the disease developed and the forming of pockets or even of shakes and cracks. On plantations of the Silvicultural Demonstration Area New Forest teak (*Tectona grandis*) trees were attacked by a new canker disease, which killed many young trees of 10 to 20 in. in girth. A species of *Stylonectria* was identified as the causal agent and its activities form the subject of a special paper.

Long (W. H.). **Polyporus farlowii and its rot.**—*Lloydia*, viii, 3, pp. 231–237, 4 figs., 1945.

In the United States *Polyporus farlowii* appears to be confined to semi-arid, hot localities. Its northern limit is northern New Mexico, its eastern boundary west Texas, while to the west it extends as far as the Pacific; its southern limit has not yet been ascertained. At Phoenix, Arizona, all kinds of ornamental trees, except, probably, elms and ashes, are badly attacked by heart rot due to this fungus. This applies particularly to pepper trees (*Schinus molle*), cottonwoods [*Populus* spp.], willows [*Salix* spp.], box elders [*Acer negundo* and vars.], elders (*Sambucus* spp.), and mulberries (*Morus* spp.). The pepper tree appears to be specially susceptible, followed by *S. mexicana*; as a rule every bush of the latter host which has attained a diameter of 4 in. at the ground is found locally to have the heartwood destroyed by the fungus, the rot extending even into the small branches if they have any heartwood. On the other hand, the fungus, for some reason not yet determined, is very rare on pepper trees in Los Angeles. The rot caused by *P. farlowii* is of the cylindrical type and usually extends completely to the sapwood, so that branches are readily broken off or the trunks split. The heartwood is not entirely destroyed and the texture and colour of the wood do not appear to have been appreciably changed.

P. farlowii (syn. *P. munzii*, *Inonatus schini*) [*R.A.M.*, ix, p. 753] is described as having annual sporophores, spongy and watery when fresh, firm and rigid when dry, single or imbricated, ungulate and dimidiate or irregular, 4 to 22 cm. side to side, by 4 to 18 cm. front to back, by 1 to 13 cm. thick. The surface, strongly hispid when fresh, often becomes glabrous with age, the upper surface chestnut-brown from the dense, hirsute pubescence, azonate, margin thick or thin, obtuse or acute. The sterile zone is 1 to 6 mm. wide, and 1 to 2 cm. or more thick. The

context is hazel. The tubes are avellaneous to tawny, angular, oval, or irregular, and 1 to 20 mm. long, the setae brown, straight, or cat-claw-shaped, and 8 to 10 by 20 to 30 μ. The pores, angular at maturity, 4- to 6-sided, are 2 to 4 per mm. and the smooth, oval, light brown spores measure 6 to 10 by 4 to 7 μ.

The only remedy for the disease is to prevent entrance by removing dead limbs and protecting the tree against wounds that reach the heartwood. If a wound is present, the damaged bark should be removed, and the exposed surface treated with shellac or white lead paint.

MARTÍNEZ (J. B.). **El estado actual del problemo de la grafiosis del Olmo.** [The actual status of the problem of Elm graphiosis.]—*Montes, Madr.*, i, 2 pp. 48–56, 9 figs., 1945.

The available information concerning the reactions of European, Asiatic, and American elms to *Ceratostomella ulmi* is summarized [*R.A.M.*, xviii, p. 558 *et passim*]. Applying the knowledge experimentally acquired, notably in Holland and Italy, to the Spanish position in respect of the elm disease, the writer advocates the importation and large-scale diffusion of the Buisman elm (a variety incorporating some features reminiscent of *Ulmus foliacea* and others of *U. pirocera*) in Spain, the acclimatization of the highly resistant *U. pumila*, and hybridization of the last-named with the Buisman elm and indigenous species.

HIRT (R. R.) & LOWE (J. L.). **Danger of decay in poorly seasoned lumber.**—*J. For.*, xliii, 10, pp. 717–718, 1945.

The recent imperative demands for timber in the United States have brought a quantity of poorly seasoned material on the market, and two cases of rapid and serious decay by *Poria microspora* [*R.A.M.*, xxiv, p. 300] in houses constructed with such wood in New York State are described. In one of the houses the woods used for studs, sheathing, and siding were Douglas fir [*Pseudotsuga taxifolia*], southern pine [*Pinus* spp.], and western red cedar [*Thuja plicata*], and in the other the subflooring was of southern hard pine [*P.* spp.]. In the former instance the removal of the rotten wood and the application to the new repair material of a modern preservative containing 4 per cent. zinc naphthenate arrested the progress of infection, though 'bleeding' continued in the untreated spots in shaded portions of the walls.

BLUMER (S.). **Über ein starkes Auftreten des Hausschwammes (Merulius domesticus Falck) im Herbst 1942.** [On a severe outbreak of dry rot (*Merulius domesticus* Falck) in the autumn of 1942.]—Abs. in *Mitt. naturf. Ges. Bern*, c, pp. xxix–xxx, 1943. [Received December, 1945.]

From September to December, 1942, 14 cases of dry rot (*Merulius domesticus*) [*M. lacrymans*] were brought to the writer's notice, and these certainly represent a mere fraction of all those occurring in Switzerland during the same period. The unusual prevalence of the fungus is attributed to the inadequacy of the heating facilities during the previous winter.

FISH (S.). **The Plant Research Laboratories, Burnley wartime activities.**—*J. Dep. Agric. Vict.*, xliii, 9, pp. 386–388, 1 fig., 1945.

In this short survey of war work at the Burnley Plant Research Laboratories, Victoria, it is stated, *inter alia*, that all cabbage and cauliflower 'mother' seed used in Victoria during the past three years has been treated at the Laboratories for the Commonwealth Vegetable Seeds Committee, and most of the celery seed commercially used in the Melbourne area, celery leaf spot [*Septoria apii*] being successfully controlled by the use of treated seed.